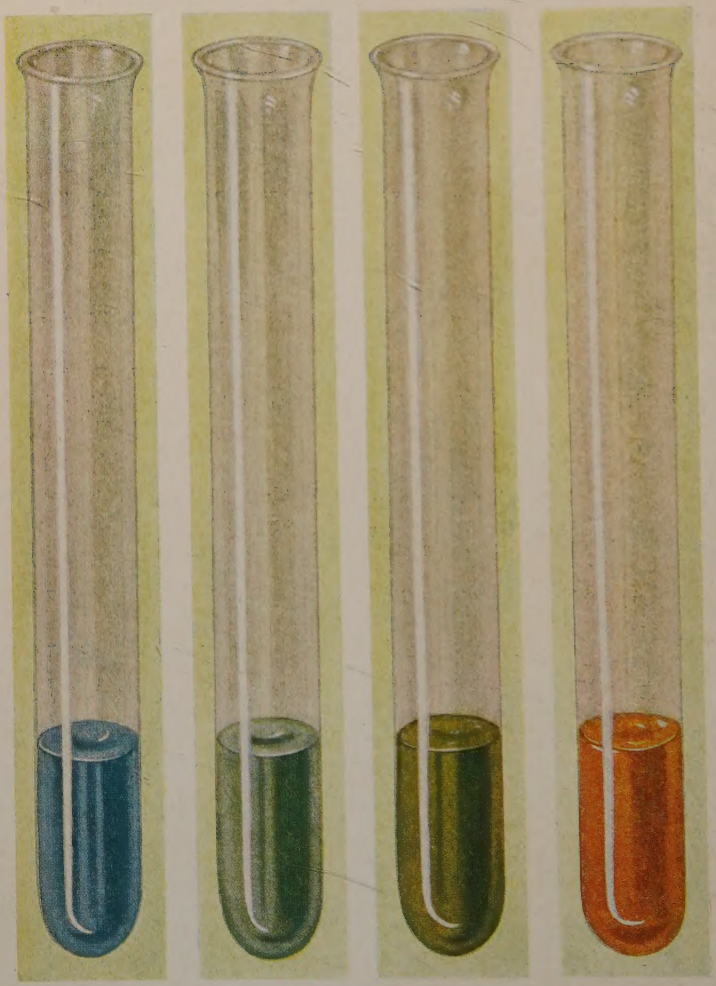
A Primer for Diabetic Patients

WILDER

Fourth Edition
Revised



THE BENEDICT TEST FOR SUGAR IN THE URINE.

Each tube contains 5 c.c. of Benedict's reagent and 8 drops of urine. The tubes have been heated for five minutes in a boiling water-bath and allowed to cool (see page 17).

A Primer
for
Diabetic Patients

A Brief Outline of the Treatment of Diabetes with Diet and Insulin, Including Directions and Charts for the Use of Physicians in Planning Diet Prescriptions

By

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FOURTH EDITION, REVISED

Philadelphia and London

W. B. Saunders Company

1930

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PREFACE TO THE FOURTH EDITION

THE last edition of this Primer was published five years after the introduction of insulin. It represented the therapeutic application of the conclusions arrived at by experiment and as a result of experience with the very large number of diabetic patients in the Mayo Clinic. The three years that have followed have added little to necessitate revision. Diets have been tested which differ from those advocated in the Primer, in that the allowance of carbohydrate was much more liberal, but experience with them leads me to believe that they are less satisfactory than those previously advocated.

The success of the treatment of diabetes is usually proportional to the constancy with which the patient's urine is kept free from sugar. A sugar-free urine usually means a normal or low blood sugar and a pancreas protected from further injury. A urine showing sugar usually means that the disease is being aggravated. In some cases, diabetes is so severe that the pancreatic islets can suffer no further injury. Liberal diets are perhaps permissible then since high blood sugars can do no further harm. The majority of our patients, however, suffer from the disease in an incomplete form.

They still possess some residuum of a native tolerance which it is a duty to preserve. There is even hope for them that a conscientious adherence to a diet will be rewarded by an augmenting tolerance. My chief objection to the high carbohydrate diets is that they increase the difficulty of treatment. Wider fluctuation of blood sugar occurs and it becomes almost impossible to prevent sugar in the urine. The patient soon tires of trying to do so and the result is that the treatment is carried out very imperfectly. For this reason, I still adhere to diets that are planned with strictly limited amounts of carbohydrate and protein.

Amplification of the text has been avoided in order not to add to the complexity of the subject. This must be kept in its simplest form if the book is to continue to have a wide usefulness. As stated before, it is intended as a guide to the patient and his physician. The control of diabetes can be accomplished only when a rigid dietary discipline is maintained. The intelligent co-operation of the patient is necessary, a co-operation which involves not only his willingness but also his understanding. The physicians' major task is the imparting of this understanding.

The book is not written for the unassisted patient. Medical terminology is omitted; nevertheless, the guidance and interpretation of a physician will be needed. No apology is necessary for this. No patient with a disease as serious as diabetes should be encouraged to attempt self treatment.

It is pleasant again to acknowledge indebtedness to

my associates, especially Miss Florence H. Smith, S. B., formerly Dietitian of St. Mary's Hospital, now of the University of Chicago Clinics, Miss Mary A. Foley, Dietitian of the Kahler Hospitals of Rochester, Minnesota, Dr. S. F. Adams, Dr. F. N. Allan, and Dr. M. H. Power of the Mayo Clinic Staff.

R. M. W.

University of Chicago Clinics,
Chicago, Ill.,
September, 1930.

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A Primer for Diabetic Patients

SECTION I

WHAT DIABETES IS AND WHAT MAY BE EXPECTED FROM TREATMENT

The word diabetes comes from the Greek, and means fountain. The disease was known to the ancient Greeks and received its name from the large flow of urine which is one of its chief symptoms. This excessive urination is provoked by sugar which comes from the starch and the actual sugars of food, from fats to a limited degree, from albuminous food-stuff like meat, and, to some extent, from wasting body tissues. The process of making sugar from the food-stuffs is a normal one; there is always sugar in the blood in small amounts, about 1 part in 1000, and, in fact, it is as sugar that a large portion of the food enters the tissue cells for consumption. The fault in diabetes is not that the body makes more sugar than usual, but that it cannot use what it has made. Unused sugar thus accumulates in excessive amounts, and some of this passes into the urine through the kidneys. The prominent symptoms of diabetes are

the presence of sugar in the urine, an excessive flow of urine, and loss of weight and strength.

The body disposes of incoming sugar in one of three ways. That which it needs at once for energy or heat it burns. The balance it stores in the form of a starch-like substance called glycogen, or in the form of fat. The processes of burning and storing sugar require the help of a ferment just as do those of bread-making and beer-brewing. The body ferment concerned with the utilization of sugar is prepared by the pancreas, a gland located in the abdomen and connected with the upper part of the intestine by a duct or channel. This gland has two separate functions. It makes ferments to be secreted into the digestive tract to assist digestion, and, in addition, it prepares and delivers into the blood the important substance concerned with the burning of sugar and the prevention of diabetes. Actually one part of the pancreas aids in digestion, and another part, consisting of isolated groups of cells, the so-called islands of Langerhans, is responsible for the internal secretion.

Diabetes results from injuries and insults to the pancreas. Excessive eating may lead to obesity and diabetes. Infections, such as the "flu" or scarlet fever, may provoke diabetes. Stones in the pancreatic duct, tumor of the pancreas, or hardening of the arteries which carry the blood to the pancreas may result in diabetes. Other disturbances, some of these hereditary, bear on the cause of this disease, as diabetes often runs in families.

The aim in the treatment of this disease is to provide rest for the diseased or injured pancreatic tissues. Rest is a great restorer, the best remedy for many human ills. A man with a weakened heart, for instance, is usually confined to his bed and is dosed with digitalis, a drug that slows the rate of the pulse. These measures reduce the load on the heart muscle and thus restore its strength. In a similar manner a certain degree of recovery may be expected in an injured pancreas if its load is lightened by removing the strain of food (sugar) in excess of the amount that can be utilized. Any organ that is pushed to overexertion becomes exhausted. This is so true of the pancreas that, if the constant irritation of excess sugar is continued by injudicious eating, diabetes becomes worse and worse. Hence the importance of the diet in the treatment of this disease.

Insulin, which is now in use as a medicine, is a watery solution of the internal secretion of the pancreatic glands from slaughter-house animals. It was discovered by Canadian scientists, Dr. F. G. Banting and Mr. C. H. Best, in the Department of Physiology in the University of Toronto. When insulin is injected into the body of a patient it promotes the utilization of a definite amount of sugar, thus doing part of the work the pancreas would do if normal, and thus in a manner supporting the diseased pancreas. Insulin makes it possible for a patient to eat the food necessary to keep him in normal weight and strength without

further injury to his pancreas. This does not constitute a cure, yet it does represent a great advance in treatment, and, while it is still too early to predict the final results of the combined use of insulin and careful dieting, the experience to date suggests that considerable actual recovery of the diseased pancreatic tissues gradually results in early cases.

The daily dose of insulin and the amount of food for which this dose will provide must be determined separately for each patient. The two, food and insulin, should be nicely balanced in order to avoid, on the one hand, excessive sugar in the blood and other tissues, and, on the other hand, discomfort and possible danger from overdosage with insulin. This necessitates careful planning of diets and intelligent co-operation of the patient with his physician. The patient must understand his disease and learn how to check it. The success of his treatment will depend on his knowledge of how to plan his menus and weigh his foods with accuracy, how to test his urine, and how to use insulin. The very exact dieting required seems formidable to many patients at first, but they soon learn how greatly the reward justifies the effort expended in acquiring the necessary skill. There are many afflictions worse than diabetes.

SECTION II

THE TESTS FOR SUGAR AND DIACETIC ACID IN THE URINE

A SIMPLE test will reveal whether or not the urine contains sugar. This is described in detail later. A teaspoonful of a greenish-blue solution is placed in a glass tube. Six drops of urine are added; the tube is shaken and heated. If the greenish-blue color remains after heating there is no sugar. If it is replaced by some other color, sugar is present. If much sugar is present the greenish blue gives place to red. Here are signals as significant of safety and danger as the green and red lights that guide the engineers of railroad trains. Green means a clear track, red means stop.

Without this sugar test the patient cannot be certain that his diabetes has been checked, and so much depends on keeping sugar out of the urine that the test must not be neglected. Health and life itself are at stake. A cent a day, the cost of the necessary solution, is little enough to pay for this indispensable guide. If there is no reaction to the test, the diet and insulin dose are right. If the reaction is bad, either

the diet is being neglected or the insulin dose is insufficient.

When the urine shows sugar it not infrequently also shows diacetic acid. This substance is a stupefying poison formed when sugar is being inadequately utilized, as will be discussed below, and its presence in the urine is a warning of impending coma that cannot be disregarded with impunity. When the urine is sugar free there is no necessity for making the test for diacetic acid, because the latter only forms in dangerous amounts when the larger part of the sugar of the diet is failing to burn and being excreted.

The patient should examine the urine twice daily, testing the morning voiding and a specimen voided before the evening meal. He should test for sugar. If sugar is found, but only then, need he apply the test for diacetic acid.

Benedict's Test for Sugar in the Urine

Benedict's solution can be ordered from several wholesale drug firms. When placing such an order the patient should be sure to specify *Benedict's qualitative solution.* There is another Benedict solution, called the quantitative solution, which does not give a color with sugar. The use of this by mistake has led to fatal consequences.

Benedict's solution may be prepared by the local druggist, according to the following directions:

	Gm. or c.c.
Copper sulfate (pure crystallized)	17.3
Sodium or potassium citrate	173.0
Sodium carbonate, crystallized. (If the anhydrous sodium carbonate is used, only one-half this amount should be taken)	200.0
Distilled water, to make	1000.0

The citrate and carbonate are dissolved together with the aid of heat in about 700 c.c. of water. The mixture is poured (through a filter if necessary) into a large beaker. The copper sulfate is dissolved separately in about 100 c.c. of water and is poured slowly into the first solution, with constant stirring. The mixture is cooled and diluted to 1 liter. This solution will keep indefinitely.

Directions for the Test.—Place 5 c.c., or a trifle over 1 teaspoonful, of Benedict's solution in a test-tube and add to it exactly 8 drops of the urine to be tested. Shake and then heat this over a free flame (alcohol lamp), boil vigorously for three minutes, and allow to cool of its own accord. If sugar is present, a large amount of precipitate will form, filling the solution from top to bottom. The precipitate will be greenish, yellow, or red, depending on the amount of sugar present (Plate 1).

A very convenient way to heat the test-tube is to place it in a teakettle or pan which contains a small amount of boiling water. In this case the heating must be continued for five minutes, during which time the water must boil vigorously. The advantages of this

method of heating are that there is little danger of the alkaline solution boiling over and burning the fingers, and little danger of breaking the test-tube.

It is important to clean the test-tube thoroughly after each test. This can be done with a cotton swab or with a test-tube brush. The precipitate clings to the glass and will not rinse away.

To Prove the Reliability of the Benedict Solution.—Before depending on any new supply of Benedict's solution it is wise to prove its activity by testing it as follows: Place a teaspoonful of the solution in a test-tube and add the amount of glucose which can be held on the blade of a pen-knife. Heat as described above. If the solution is satisfactory a brownish-red deposit will occur and the blue color of the solution will disappear. Glucose can be obtained from the druggist; or 2 or 3 drops of corn syrup or honey will serve as well. Cane-sugar and beet-sugar cannot be used, since these sugars have no action on Benedict's solution.

The Gerhardt or Ferric Chlorid Test for Diacetic Acid

Directions for the Test.—To 5 c.c., or a teaspoonful, of freshly voided urine in a test-tube add a 10 per cent. watery solution of ferric chlorid[1] (chlorid of iron) one drop at a time. If diacetic acid is present a wine-red color will be produced. Continue adding the ferric chlorid until, on the addition of each drop, no fur-

[1] Liquor ferri chloridi, U. S. P., obtainable at the druggists.

ther deepening of the color is noted. The cloudiness that often forms is due to salts thrown out of solution by the iron, and is of no importance. These salts usually redissolve when enough ferric chlorid is added. Now pour half the contents of the tube into a fresh tube and heat this portion to boiling for five minutes, comparing its color after heating to the unheated portion. If the original color is due to diacetic acid, it will fade on heating, and the heated tube will have a lighter hue than the unheated tube. The test is not complete, therefore, until the effect of heat on the color has been determined. Certain drugs, like aspirin and antipyrin, will cause a bluish-red color to form in the urine on addition of ferric chlorid. If the patient is being treated with these drugs the urine will have this bluish-red color when the ferric chlorid is added. This color, however, does not fade on heating.

SECTION III

WEIGHING FOODS

Many patients with diabetes have only trivial disturbances of their sugar-using facilities and thus may live for twenty years or more with little or no treatment. Quacks thrive on these mild cases. All manner of patent medicines seem to help them, provided some simple diet rules are followed; the directions accompanying diabetic remedies invariably call for dieting, and the credit is given to the medicine when the simple restriction of starches and sugars is responsible for any betterment obtained. The experience or testimonials of such persons are valueless, and the patient with a moderately severe or a severe form of diabetes courts disaster if he heeds them.

It is safer to overrate the seriousness of a case than to blunder into neglecting careful management of a severe condition. The gravest mistakes are made in the cases of children and young adults. In them diabetes may be mild during the first year, but with few exceptions it becomes very severe during the second or third year unless the most rigid management is instituted early.

With many older persons satisfactory treatment is possible with less rigid diet control than is described in the following pages. The proof of this in any individual case must be looked for in the condition of the urine. So long as the urine remains sugar free on repeated periodic testing a patient of the age of forty or more is safe, but if the urine shows sugar repeatedly despite qualitative restrictions, such as the elimination of sweets, starches, and meats, the patient's condition is dangerous and demands insulin.

To take insulin without practising strict control of the diet is to play the fool. Any case that is serious enough to need insulin is serious enough to require an accurate regulation of the food intake.

Food Scales

So much depends on the accurate weighing of foods that the food scales procured should be well made and durable. Those provided by John Chatillon and Sons, New York City (Fig. 1), and those of the Hanson Brothers Scale Company, 525 North Ada Street, Chicago, are particularly suitable, because the dials on the faces of these are movable and thus permit the adjusting of the zero point so that plates or cups may be employed for scale pans. The dials of these scales are graduated in grams, another advantage, since the calculating required in planning diets is much easier in the metric system than when the weighing is done by ounces and pounds.

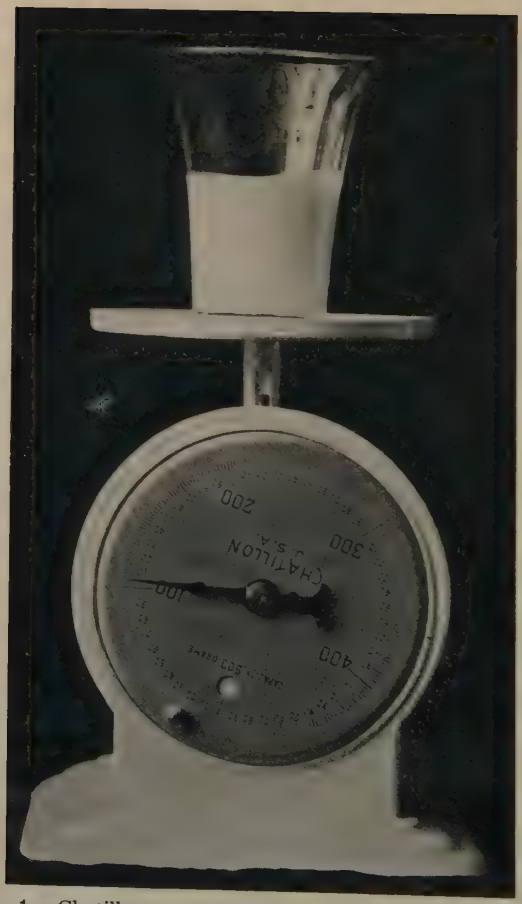

Fig. 1.—Chatillon gram scales with movable disk. A balance convenient for weighing food. An empty glass was placed on the scale pan. The dial was turned by means of the knob, so that its 0 point coincided with the pointer. Milk was then poured into the glass until the pointer stood at 105, the amount of milk desired for a certain diet.

The Metric System

The gram is the weight unit of this system. The average serving of many foods weighs approximately 100 grams; for instance, a small apple, orange, or tomato will weigh about 100 grams. A square of butter cut with a standard butter-cutter weighs 10 grams. A lump of domino sugar weighs 5 grams. The metric system, like that of our dollars and cents, eliminates troublesome fractions. For instance, here is the type of problem one has to solve in planning menus for diabetics. How much sugar is contained in an orange? To answer it one must first know the weight of the orange, so he puts it on the scale and finds, let us say, that it weighs 120 grams. The tables of food values are consulted, and it appears from them that 10 per cent (ten hundredths) of this weight is carbohydrate (sugar), and the problem is answered by multiplying 120 by 0.10.

$$120 \text{ grams} \times 0.10 = 12 \text{ grams.}$$

This calculation is exactly like what would be required to find the interest due on money borrowed. If a farmer should borrow 120 dollars and the bank should ask him 10 per cent interest, what interest would he have to pay for the use of the money? The answer is $\$120 \times 0.10 = \$12$.

Similarly, 20 per cent of a portion of food weighing 120 grams would be 24 grams, 5 per cent of it would be 6 grams, and so forth.

The metric (gram) system is in general use in Europe and among scientists in this country. In this system the unit of measurement is the meter, a rule a few inches longer than a yard-stick. The meter is divided into 100 centimeters. The unit of weight, as has been said before, is the gram; the unit of liquid measurement is a cube, each side of which is one centimeter long (a cubic centimeter). The system is so constructed that a gram is the weight of a cubic centimeter of water. This is a great convenience because it permits determining the amount of a quantity of water or liquid food, such as milk, either by weighing or by measuring its volume in a graduate. A thousand grams is called a kilogram; and larger weights, the weight of the body, for instance, are usually expressed in kilograms. Larger volumes of food are measured in liters. A liter is 1000 cubic centimeters, and a liter of water, therefore, weighs a kilogram.

Temperature in the metric system is measured with a *centigrade* thermometer. There are 100 degrees on this thermometer between the temperature of freezing water, called zero, and that of boiling water, called 100.

Heat is measured in calories, the calorie being the amount of heat necessary to raise the temperature of 1 liter of water 1 degree centigrade.* One hundred calories would bring to boiling a liter of freezing water.

* This is the large calorie.

Calories, in addition to being measures of heat, are measures of energy, because heat is evolved only in response to some expenditure of energy, such as occurs, for instance, in the burning of a fuel. Thus the fuel, or energy value of foods, and similarly the energy requirements of the human body may be expressed in calories.

The following tables give the relations existing between the metric system and the weights and measures in more common use. The patient is advised, however, to learn to think in the metric system rather than to attempt the translating of grams into ounces, and so forth.

Weights and Measures

Approximate Equivalents

1 gram (gm.)	= 1/30 ounce
1 kilogram (kg.) (1000 gm.)	= 2.2 pounds
1 cubic centimeter (c.c.)	= 1/30 fluidounce
1 liter (L.) (1000 c.c.)	= 1 quart plus $1\frac{1}{3}$ fluidounces
1 degree centigrade (1° C.)	= 1.8 degrees Fahrenheit
1 calorie (cal.)	= 4 British thermal units (B. T. U.)

To convert ounces to grams, multiply the ounces by 30.

To convert pounds to kilograms, divide the pounds by 2.2, or consult Scale I, Chart I (enclosure back cover).

Household measures should rarely be depended on for accurate diets; roughly:

1 teaspoonful of fluid	=	5 c.c.
1 dessertspoonful of fluid	=	10 "
1 tablespoonful of fluid	=	15 "
1 large cup or tumbler of fluid	=	240 "

It is sometimes useful to know that a Buffalo nickel weighs 5 gm. Buffalo nickels can be used to prove the accuracy of the food scales. Each nickel added to the weighing pan should advance the pointer 5 gm. on the dial scale.

SECTION IV

THE FUEL VALUE AND COMPOSITION OF FOODS

MAN'S body has often been compared to an engine. To heat it and run it, fuel must be supplied to be burned and converted into heat and energy. Experiments have shown that weighed quantities of food develop the same number of measures of heat when burned by man as they would if burned outside of the body, allowance being made for the fact that certain foods are incompletely burned in the body.

The measure of the fuel value of food, as has been stated in Section III, is the calorie; the calorie being the amount of heat required to raise the temperature of 1 liter of water 1 degree centigrade. Five lumps of sugar weighing approximately 5 grams each would generate, when burned, about 100 calories, and would raise the temperature of 1000 grams (1 liter) of freezing water to the boiling-point.

The bodies of men and women usually expend from 1200 to 3000 calories a day, and food must be supplied in an amount sufficient to liberate this quantity of heat. The fuel requirement in the individual case de-

pends on the amount of physical work performed and on the size of the body. A man at hard labor may expend more than 4000 calories and, therefore, should receive the equivalent of this in food. A patient confined to bed may require no more than 1000 calories. A large man needs more food than a small man. Children produce heat out of proportion to their small weights and, therefore, require relatively more food than their parents. The food of adults should produce between 20 and 40 calories for each kilogram of their weight, while children may require food producing from 50 to 100 calories for each kilogram.

Work cannot be done save at the expenditure of energy liberated from some fuel. The fires of a battleship which is steaming at 30 miles an hour must be stoked vigorously. In a man's body certain food reserves, and even the tissues of the body itself, will be consumed if the intake of food is insufficient to satisfy the existing demands for energy. In this respect the man differs from the steam engine, and for this reason it is not permissible to limit the food allowance of a patient without at the same time curtailing his physical exertion. Fortunately the introduction of insulin makes it possible to provide diets with a fuel value of from 2000 to 3000 or even more calories a day, and such energy allowances are sufficient to meet the requirements of even the most strenuous occupations.

Many apparently healthy persons consume more food than they require and thereby place an unneces-

sary burden on their vital organs. Such practice is attended with great danger in persons with diabetes.

The fuel constituents of food are carbohydrate, fat, and protein, and the fuel value of any particular food depends on the amount of each of these three substances that it contains. The fuel value of 1 gram of carbohydrate is 4 calories; that of 1 gram of protein, 4 calories, and of 1 gram of fat, 9 calories.

Carbohydrates.—The starches, such as rice and wheat flour, cane-sugar, and honey, are examples of pure or almost pure carbohydrate. The digestible carbohydrates in vegetables or fruits are diluted with water and non-digestible refuse. Such foods also contain small amounts of protein and fat. In the process of digestion the carbohydrates are completely changed to sugar.

Fats.—Examples of pure or almost pure fat foods are butter, lard, and olive oil. Cream contains from 16 to 40 per cent of fat. The meats nearly all contain a certain proportion of fat. Nuts and certain fruits like the olive are rich in fat.

Protein.—Like fat and carbohydrate, protein burns in the body as a fuel and yields energy for heat and work. It does not, however, as was formerly believed, yield any more energy than does carbohydrate, and, indeed, it is a less efficient fuel for work than carbohydrate. It serves, however, an additional purpose, that of building and repairing body tissue.

Gelatin is a protein. The white albumen of eggs is

a mixture of protein and water. The proteins of our tissues are jellies similar to egg albumen, and the peculiar properties of these jellies is responsible for life; they are, in fact, the living thing, the machinery of the body, and, like machinery of any kind, they suffer wear and tear. A minimal allowance of protein is necessary to make good the loss from such wear and tear.

It remains an open question how large the protein allowance should be. It is estimated that as little as 0.5 gram each day for every kilogram of a man's body weight will supply the minimum needed, but many authorities insist that more than this should be fed. Children undoubtedly must have more in order to provide for growth. However, large amounts of protein are unnecessary and may be harmful. More than half of the protein of the food is changed into sugar in the body, so that rich protein has the same effect as rich carbohydrate food. But more important is the fact that heavy protein meals stimulate heat production and thereby lower tolerance and aggravate diabetes.

Food Tables

The composition of the foods in most common use is to be found in the food tables, page 120. More complete food-lists are contained in Bulletin 28, United States Department of Agriculture. This pamphlet, "The Chemical Composition of American Food Ma-

terials," may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for ten cents in coin.

In addition to their fuel, the foods contain water, indigestible residues, minerals in the form of salts, and vitamins. The omission of either minerals or vitamins from the diet may be attended with the development of the so-called deficiency diseases, such as rickets and scurvy. Some foods are richer in vitamins and minerals than others, and it is important that the diet should contain a sufficient amount of them. Particularly is this true in the presence of diabetes, and for this reason it is advisable to include liberal amounts of leafy vegetables as well as some cream or milk in diets for patients with diabetes.

SECTION V

THE DIET

Collaboration of Florence H. Smith, S. B.

When beginning the treatment of a new case it is generally advantageous to insist on rest in bed and a rigid limitation of the diet for the first twenty-four hours. The soft diet, described on page 118, will serve adequately for the first day. Then a planned diet is fed, designed to supply as nearly as can be estimated the actual requirement of calories and of protein. The calculation of these requirements is explained in detail in Section X. Unless serious acidosis is present, the physician may postpone the use of insulin for several days in order to gain an estimate of the severity of the case.

Determining the Tolerance

Patients are admonished to save all of their urine while under the physician's observation. Large clean bottles should be provided as receptacles, and in these bottles must be poured all the urine passed during each twenty-four hours. The bottles are to be removed

to the laboratory each morning and the urine analyzed for sugar.* In addition, estimations may be made of the sugar in the blood.

A diet consisting of a definite number of grams each of carbohydrate, protein, and fat has a certain sugar value (glucose equivalent). A patient who is on a measured diet is, therefore, taking in a definite amount of sugar daily. The outgo of sugar is found in the urine. The intake less the outgo is the sugar which the body has used. This is the tolerance. As a rule, it improves during the first few days of treatment.

If the patient has a mild case of diabetes his tolerance will be better than that required to utilize the sugar contained in the diets recommended in Section X. In that case he may be treated without the help of insulin. If sugar remains in the urine after several days of observation with the patient on the constant diet, insulin will be needed (Section VI).

During the time spent in this estimating of tolerance the patient should be learning to plan his own menus, so that he can continue the diets of constant sugar

* It is advisable to supply the patient early with the equipment necessary to make qualitative sugar tests of his urine and to encourage him to make these tests. A small test tube rack with six tubes, a test tube holder and a spirit lamp are provided and he is asked to test each voiding under the supervision of a nurse or intern. The information gained by examining every specimen is often of great help to the physician in adjusting the insulin dosage, especially in the case of new patients and of patients with complications.

values after he returns to his work. Food lists will not do. Set diets would be satisfactory from the doctor's point of view provided the food portions were weighed, but the patient soon sickens of set diets and then abandons them. Some change from day to day is indispensable. Monotony in food is intolerable.

Monotonous diets can be entirely avoided if the patient will learn the trick of arranging his own diets to satisfy the requirements of a diet prescription. The physician can then order the diet in general terms of carbohydrate, protein, and fat, and the patient can satisfy these requirements much according to his taste. The translating of the food prescription into a breakfast, a dinner, and a supper requires some calculating, but the trick is quickly learned by an intelligent patient when it is explained to him.

Directions for Planning Diets from Diet Prescriptions

Rule off sheets of paper to match the Diet Order Sheet, illustrated in Fig. 2.

Write in the left-hand column the names of the classes of food shown in Fig. 2: "vegetables, 5 per cent; fruit, 5 per cent, and so forth."

Bear in mind that the total carbohydrate, protein, and fat allowance should be divided fairly equally among the three meals, and that, if the diet prescription calls for less than 75 grams of carbohydrate, the richer carbohydrate foods, such as bread, must be used very sparingly.

Fig. 2.

DIET ORDER

No.....Name.....Date.....

Carbohydrates.....Protein.....Fat.....Calories.....Sugar value.....

Food.	Breakfast.	Dinner.	Supper.	Total grams.	Grams: Carbohydrate.	Protein.	Fat.
Vegetables, 3 per cent.				100	3	1	0
Fruit, 5 per cent.				100	5	1	0
Vegetables, 6 per cent.				100	6	1	0
Fruit, 10 per cent.				100	10	1	0
Vegetables and fruit, 15 per cent.				100	15	1	0
Vegetables and fruit, 20 per cent.				100	20	2	0
				100	0	0	85
Butter				100	0	10	67
Bacon				1	0	6	6
Eggs				100	0	25	15
Meat				100	5	3	20
Cream, 20 per cent.				100	3	2	40
Cream, 40 per cent.				100	0	0	100
Olive oil or other fat				100	5	3	4
Milk				20	16	2	1
Cereal (dry)				100	53	9	1
Bread							
				Total grams			
FOOD VALUE OF THE DIET				Calories per gm.	4	4	9

Total calories of carbo. Equals....

Total calories of prot. Equals....

Total calories of fat Equals....

Total calories Equals....

Write in 800 grams of 5 and 10 per cent fruits and vegetables. (See Table, page 120.)

Write in from 100 to 200 grams as desired of 40 per cent cream, or if this is not obtainable, 100 to 300 grams of 20 per cent cream.

Now carry over to the "total gram" column the amounts of the foods already listed and calculate the carbohydrate, protein, and fat contained by them, according to the food tables, page 122, or Bulletin 28, United States Department of Agriculture. Write the results of these calculations in the last three columns of the sheet.

Then add up the grams of carbohydrate already included, and if this is less than the allowance, write in enough other carbohydrate-containing food to balance the allowance. For this purpose the 15 and 20 per cent vegetables and fruits, cereals, and bread-stuffs can be used. Calculate the amounts of protein and fat contained in these later additions and enter these amounts in the columns for protein and fat.

Next attend to foods richer in protein. A certain part of the protein allowance will have been expended already by the protein in the fruits, vegetables, milk, cream, and bread already listed, but a considerable balance will remain, and this can be used for meats, fish, cheese, and eggs as desired. Enter the amounts of each food chosen in the appropriate places in the columns for breakfast, dinner, supper, and total grams,

and carry over to the columns on the right for protein and fat the number of grams of protein and fat calculated from them.

At this stage the grams of carbohydrate and grams of protein listed should match the allowances of carbohydrate and protein in the prescription, and all that remains to do is to balance the column of fat. This can be done by writing in the necessary amounts of butter, olive oil, or sugar-free mayonnaise.

The diets fed to the patient while under the physician's observation should be planned in this manner, and copies of these diet sheets should be given to the patient so that he can compare the trays he receives with the diet order, and so that he can have these sheets for home reference later.

It is not necessary to carry out the entire calculation as described above, or to prepare a new diet sheet each day in order to provide variety. Pleasing changes can be obtained by substituting one vegetable for another in the same group (page 120), or by using different fruits of the same group from day to day.

Furthermore, it is possible with lists of food equivalents to modify a diet sheet appreciably by substitution with little or no recalculating. (See page 124 for lists of substitutes for butter, bread, and eggs.)

Foods

Breads.—One of the main hardships in diabetes is the necessary restriction of bread. With a carbohy-

drate allowance of less than 100 grams the patient can poorly afford more than a few grams of bread at a meal, 10 or 20 at the most. Under no circumstances should he cut down his 800-gram allowance of 5 and 10 per cent vegetables and fruits for the sake of bread.

The so-called breads and flours for diabetics are not very satisfactory. Objections to them are numerous. Some such breads are made with large proportions of washed bran. This is irritating to the bowel, and in certain cases causes so much intestinal distress that vegetables and fruits must be omitted. Bran is frequently recommended as a corrrective for constipation, but it is better to depend on vegetables and fruits which are equally good correctives and, in addition, carry the indispensable vitamins and minerals. Bran, particularly washed bran, has little value. Bran and cellulose held a place in the diets of diabetics when patients were starved perforce in the days before insulin became available, but now they can be forgotten with advantage.

Other bread substitutes are excessively rich in protein. Many of them are made with gluten. Some are composed of casein. The casein breads are better than the gluten breads, because casein (milk-protein) is a more satisfactory protein for tissue building than gluten. The objection to both of them, however, is that the addition to the diet of much of such foods will raise the total protein quota of the diet undesirably. Furthermore, commercial bread substitutes are high

in cost and uncertain in composition. It is cheaper and safer to avoid them.

Many patients and some doctors labor under the misconception that dark-colored breads, such as rye and Graham breads, are poorer in carbohydrate and, therefore, more available for diabetic patients than white breads. The tables of food values (page 122) should disabuse them. Another myth is the reputed virtue of toasted breads. The sugar which the body derives from breads of different kinds is illustrated in Fig. 3.

A very palatable bread substitute of definite composition can be made with finely ground soy beans. A recipe for soy muffins is given on page 88. The soy bean has the virtue of being richer in fat and poorer in protein than gluten or casein flours. Several soy-bean flours are on the market, being sold usually at rather fancy prices. Equally satisfactory products may be manufactured in the home from soy beans purchased at a very low cost from the feed store.

The pop-overs, for which a recipe is given (page 89), are a useful form of bread in diets in that they serve as a pleasant vehicle for butter without having a very high carbohydrate or protein value. Similarly the soda wafer is a helpful spread for butter. A wafer the size of a Uneeda biscuit contains 5 grams of carbohydrate and less than a gram of protein.

Desserts and Fruits.—The diabetic is somewhat handicapped when it comes to a choice of desserts.

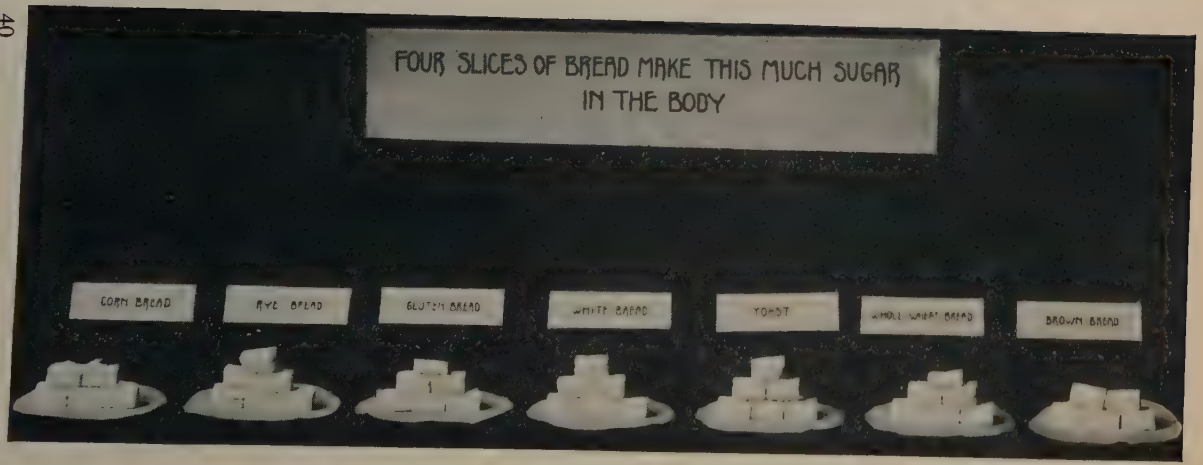

Fig. 3.—Relative amounts of sugar produced in the body by corn, rye, gluten, white, whole wheat and brown breads, and toast. (Reprinted by permission of Dr. Reed Rockwood.)

Cakes, pies, and pudding, in fact, all sugared articles, are so rich in carbohydrate that they are out of the reach of his restricted carbohydrate allowance. Ice-cream he can have if he sweetens it with saccharin instead of sugar, and most of the fruits are available if he takes them in their natural state or preserves them without sugar, as is possible by the cold or water-packed method. Water-packed fruits can now be purchased in small cans from several wholesalers, or they may be prepared at home according to the directions given on page 86. The contents of the cans of such fruits are about half as rich in carbohydrates as the original fruit, since in canning them an amount of water is used equal to the amount of fruit, and the carbohydrate of the fruit divides itself equally between the juice and the fruit. Fruit canned with sugar is, of course, unsuitable for a diabetic.

Vegetables.—Vegetables come high on the list of desirable foods for diabetics because of their bulkiness which aids in preventing constipation and because they are important carriers of vitamins and minerals. They should form the basis of every diet, 500 or 600 grams of 5 or 10 per cent vegetables being the first item to be written into the menu for the day. Canned vegetables are wholesome and palatable, and if properly prepared for serving retain their richness in vitamins. When served hot they should be heated in the closed can, because they lose their vitamins rapidly if exposed to the air during cooking. It is not necessary to pur-

chase special brands of canned vegetables; and in fact, a brand suitable for the other members of the family is preferable. Each can as it is opened will then be disposed of at a single meal.

Cream and Milk.—Cream is of great service in diets for diabetics, more so than milk, because its fuel value is greater in proportion to its carbohydrate content. The diet of children, however, should include 500 grams of milk. Twenty per cent cream, that is, cream containing 20 per cent of butter fat, is the cream ordinarily sold for table use. This is sometimes called coffee cream. Forty per cent cream is the heavy, rich cream commonly called whipping cream. The patient should make inquiry at his dairy as to the butter-fat content of the cream he is buying.

Butter.—Butter is an excellent source of calories. In composition it is 85 per cent fat. A standard butter-cutter cuts a pound of butter into forty-eight squares, each square weighing 10 grams. It is well for the diabetic patient to cultivate a taste for butter. It is delicious when ice cold, and especially when unsalted, and in this form can be spread thick.

Bacon.—Bacon is most palatable if broiled crisp. If served in this way it should be weighed after and not before cooking. The composition of broiled crisp bacon is approximately the same as that of raw bacon.

Mayonnaise.—Mayonnaise with olive oil made by any standard recipe without sugar is approximately 85 per cent fat and a useful vehicle for extra fat.

Condiments, Sweetening Agents, Alcoholic Beverages, Tobacco

Condiments.—Coffee and tea should be taken sparingly by the diabetic patient. As they have little food value when clear, they need not enter into the diet calculations. Pepper and other spices are without significant food values. The same is true of vinegar and extract of vanilla.

Sweetening Agents.—Saccharin is permissible for sweetening purposes if used in moderation. It is likely to become bitter by heating and should, therefore, be added to cooked foods after the food has been removed from the fire. The use of honey and glycerin is not recommended.

Alcoholic Beverages.—Sour wines are of great value as adjuvants to the diet in diabetes. The carbohydrate content of such wines is insignificant; the alcohol contained in small portions adds to the fuel value of the diet without placing much, if any, strain on metabolism; the attractiveness and palatability of the meal are enhanced by wines. Near-beer and beer are less suitable than sour wines, because the carbohydrate they contain is variable. Unsweetened distilled liquors, such as brandy and whisky, injurious if taken immoderately, are serviceable as appetizers and tonics when used in great moderation. The fuel value of 1 gram of alcohol is 7 calories.

Tobacco.—The use of tobacco is of doubtful benefit, and the abuse of tobacco is probably more harmful to a person with diabetes than it is to others. Consider-

able moderation is advisable, therefore, in this indulgence.

Special Preparations

We have arrived at the conclusion that commercial food preparations for diabetics are undesirable. Such preparations are expensive and their composition is often uncertain. With the exception of soy-bean meals and water-packed fruits, neither of which are strictly speaking "diabetic foods," we have abandoned the use of special preparations altogether. The patient should learn that any food that is a real food adds something to the strain on his sugar-utilizing facilities. In a sense no food is strictly speaking "good for diabetes," and many commercial foods are definitely injurious. It is best to learn to select a diet from among the foods served to other members of the family.

Regulating Body Weight

When a patient has been instructed in dietetics he should have no difficulty in holding his body weight at or near that desired by his physician. If he is gaining flesh in excess of the proper weight a slight readjustment of the diet will correct the difficulty. Any change made should be in the fat allowance; the carbohydrate and protein allowances should not be diminished. If the patient loses weight on the original diet, the fat allowance may be increased. No changes whatever should be made in the diet prescription without the consent of the physician.

Traveling

The best health resort for diabetes is the patient's home, because the diet can be adhered to with greater accuracy than is usually possible elsewhere. No climate or spring water will compensate for the damage done by neglecting diet while sojourning at a spa or traveling.

It is always difficult to select food from that offered in the dining car or hotel which will meet the requirements of the diet. If the journey is a short one and only one or two meals are to be taken away from home, these should be prepared in the home and carried with the traveler. If the journey is longer or undertaken without time for preparation, the patient may select a meal from the simple menus that follow. The calorie value of these meals was purposely made less than that provided by the standard home diet. It is safer when in doubt to go somewhat hungry. When a temporary residence is established away from home, the food scales should be brought into use and arrangements made to resume the home diet as early as possible.

Menus for Travelers*

Breakfast—Sugar Value, 40 grams

I. Toast, 40 gm	2 thin slices
Orange, 100 gm	1 medium size
Butter, 20 gm	2 squares
20 per cent cream, 50 gm	¼ glass

* These menus are taken from the Diet Note Book used on my service at St. Mary's Hospital, Rochester, Minn. They were planned by Miss Florence Smith and Dr. F. N. Allan.

Note.—One cup of tea or coffee with each meal if desired.

Breakfast—Sugar Value, 40 grams

II.	Toast, 20 gm	1 thin slice
	Banana, 100 gm	1 medium size
	Butter, 20 gm	2 squares
	20 per cent cream, 50 gm	¼ glass
III.	Shredded wheat biscuit	1
	20 per cent cream, 100 gm	½ glass
	Orange, 100 gm	1 medium size
IV.	Toast, 30 gm	1½ thin slices
	Butter, 10 gm	1 square
	Egg	1
	Milk, 200 gm	1 glass
V.	Toast, 20 gm	1 thin slice
	Butter, 10 gm	1 square
	Ham, 30 gm	1 thin slice
	20 per cent cream, 50 gm	¼ glass
	Apple, 100 gm	1 medium size

Noon or Evening Lunch—Sugar Value, 40 Grams

I.	Uneeda biscuit, 28 gm	4
	American cheese, 40 gm	cut 1″ x 1″ x 2″
	Milk, 200 gm	1 glass
II.	Bread, 30 gm	1½ thin slices
	Butter, 15 gm	1½ squares
	Ham, 30 gm	1 thin slice
	Milk, 200 gm	1 glass
	Lettuce, celery, dill pickles as desired.	
III.	Oyster stew	6 oysters
	Uneeda biscuit	2
	Apple, 100 gm	1 medium size
	Celery, dill pickle as desired.	

Note.—One cup of tea or coffee with each meal if desired.

Noon or Evening Lunch—Sugar Value, 40 grams

IV.	Bread, 30 gm	1½ slices
	Butter, 10 gm	1 square
	Peanut butter, 20 gm	1 tablespoonful
	Milk, 200 gm	1 glass
V.	Rye bread, 40 gm	2 thin slices
	Butter, 20 gm	2 squares
	Head lettuce, 150 gm	½ large head
	Salad oil and vinegar	as desired
	Orange, 100 gm	1 medium size
VI.	Bread, 40 gm	2 thin slices
	Butter, 20 gm	2 squares
	Egg	1
	Celery, lettuce or tomato	as desired
	Grapefruit, 100 gm	½ medium size
VII.	Whole wheat bread, 30 gm	1½ thin slices
	Butter, 15 gm	1½ squares
	Pecan nuts, 30 gm	20 halves
	Apple, 100 gm	1 medium size
VIII.	Uneeda biscuit, 35 gm	5
	Milk, 100 gm	½ glass
	20 per cent cream, 100 gm	½ glass
IX.	Graham crackers, 35 gm	5
	Milk, 200 gm	1 glass
X.	Clear broth	1 cup
	Bread, 40 gm	2 thin slices
	Butter, 20 gm	2 squares
	Lettuce	for sandwiches
	Banana, 75 gm	1 small size

Note.—One cup of tea or coffee with each meal if desired.

SECTION VI

INSULIN AND ITS USE

In 1889 a young German student by the name of Minkowski discovered that the removal of the pancreas caused diabetes in animals. It was common knowledge even then that the pancreas contained numerous clumps of cells (islands) which differed in appearance from the cells of the tissue connected with the pancreatic ducts, and it was suspected that these islands took no part in the formation of digestive juices. In 1890 it was learned that the tissue connected with the ducts could be destroyed by tying off the head of the pancreas from its connection with the intestine, and that animals treated in this manner did not develop diabetes. Since the islands were not destroyed by this operation, it appeared that they poured their secretion into the blood and that this secretion was the substance whch prevented diabetes. The most skilful and experienced investigators then turned their best efforts toward securing this substance in a form that would be active in treating diabetes, but no progress was made in this direction for thirty years.

No benefit resulted either from feeding fresh pancreas or from giving pills or other preparations of pancreas by mouth. The reason for this became evident when finally, in 1922, Banting obtained his insulin. Insulin is destroyed by the digestive juices, and it is therefore doubtful whether pancreatic pills can ever be effective in diabetes.

It is perhaps just as well that insulin must be injected. People are very careless with medicines that they take by mouth, and may be expected to observe greater pains in measuring their insulin doses since they have to take them with a hypodermic needle. Insulin must be measured carefully, or no good, and, indeed, serious harm may result from its use.

Insulin is protected by the patent laws. The patenting of discoveries in medicine for commercial advantage is frowned upon by physicians, but the patents covering insulin are held by the University of Toronto, not for commercial advantage, but to prevent the exploitation and possible discrediting of this valuable remedy, as well as to insure that the products of various firms will have a uniform potency. Accurate treatment would be impossible unless the physician and patient could depend on the strength of the insulin preparations at their disposal. This was recognized early by the discoverers, and the manufacture of insulin was restricted to firms who would permit the insulin committee of the University of Toronto to exercise control over their products. The firm of Eli

Lilly and Company of Indianapolis was the first to prepare insulin for the United States, but several other reliable firms are now making the product.

Description of Insulin.—Insulin comes in solution as a water-clear fluid. It is dispensed in small vials, each of which has printed on its label the number of units contained in the whole vial and the number of units in each cubic centimeter of the solution contained in the vial. A unit of insulin is a very definite amount. Its effect on the sugar in the blood of a patient is the same from day to day, provided the diet is not altered and provided also no complicating diseases supervene. With such diets as are recommended in Section X each unit of insulin injected adds to the patient's tolerance from 1.5 to 2 grams of sugar. Few patients, even among those with the severest diabetes, require more than 50 units a day, and the cost of insulin is therefore well within the reach of nearly everyone. Indeed, the cost seems negligible when it is remembered that many patients would be helpless invalids without insulin and dependent on relatives or charity, whereas with the help of insulin they are strong and fit to work at their usual gainful occupations.

Insulin is dispensed in vials containing 5 and 10 c.c. each. A uniform system of labeling has been adopted by all the American manufacturers as follows:

Blue label	U-10 contains 10 units in each c.c.
Yellow label	U-20 contains 20 units in each c.c.
Red label	U-40 contains 40 units in each c.c.

Directions for Injecting Insulin.—Secure two glass syringes, capacity 1 c.c., one for daily use, another to keep in reserve against breakage. A number of insulin syringes are on the market, with markings indicating the number of units they hold. There is an objection to these in that they lead to confusion whenever a patient changes from one strength of insulin to another. For this reason the Becton-Dickinson Company have prepared for me the 1 c.c. syringe illustrated in Fig. 4. This syringe is graduated as indicated to $\frac{1}{4}$ c.c. When it is filled to the 1 c.c. mark it contains the number of units indicated by the label on the insulin bottle, *i. e.*, 10 units in the case of U-10, 20 units with U-20, 40 units with U-40. When it is one-half full it contains half these amounts, when one-quarter full one-fourth these amounts, and so forth.

Secure at least two, preferably six or twelve, hypodermic needles to fit the syringes. A number 24-gage needle is recommended.

Keep one syringe and two needles in a small covered glass jar half filled with 95 per cent alcohol. Clean cheese-cloth or gauze cut in small squares should pad the bottom of this jar. Kept in this way syringe and needle are always sterile and ready for use. Boiling to sterilize is time-consuming and may crack the syringe. When through using it the syringe should be rinsed with alcohol and replaced in the jar.

The alcohol used for this purpose may be "medicated" alcohol. It must, however, be 95 per cent

Fig. 4.—Syringe for injecting insulin.

alcohol, as otherwise the needles will rust. Druggists can supply alcohol medicated with formaldehyd and glycerin suitable for this purpose. Some medicated

alcohols contain substances which cause the needles to rust or make the insulin turbid.

A pair of forceps is useful for removing the needles from the jar and attaching them to the syringe. Great care must be taken to avoid touching the needle with the fingers and thereby contaminating it.

A supply of sterile absorbent cotton is required. When preparing to take insulin fill the syringe with alcohol from the jar, remove the needle from the jar of alcohol with forceps, and press it carefully onto the syringe. Empty the syringe and needle of all alcohol by pulling the plunger back and forth several times. Wipe the top of the insulin bottle with a piece of cotton wet with alcohol. Fill the syringe with air by pulling the plunger back, then push the needle through the clean rubber cap of the insulin bottle. Force the air contained in the syringe into the bottle, then fill the syringe with insulin in the required amount, taking care to expel air-bubbles if they appear in the syringe, by pushing the plunger into the syringe again.

Wash the skin where the insulin is to be injected with cotton wet with alcohol, pick up a fold of skin between two fingers, and push the needle under the skin in a slanting direction. The point of the needle should be inserted well under the skin, but not deep in the tissues. Turn the syringe a quarter of a revolution to the right or left, thereby making sure that the point is not in the skin, then force home the insulin

and remove the needle. Hold the alcohol cotton over this small puncture wound for a few seconds.

Where to Inject Insulin.—The injection may be made into any part of the body where the skin is loose. Suitable places are the upper arm, sides of the trunk, and outer surfaces of the thighs. Proximity to visible veins and to joints should be avoided. The place of injecting must be changed frequently, as otherwise the tissues become hard and may break down.

Determining the Insulin Dose.—The dose of insulin required by a patient will depend both on his diet and on his native tolerance. With the diets of the constant sugar value (glucose equivalent), 120 grams recommended, it should seldom be necessary to use more than 50 units a day except when complications exist. If the native tolerance is high, that is, in mild cases, insulin may be unnecessary provided the diet is followed strictly. In moderately severe cases from 10 to 30 units a day are required. Just enough should be used so that the urine will be free of sugar; more will provoke insulin reactions.

The preliminary observation of a patient was described in Section V, and the determining of his native tolerance was there discussed. At the end of a week of observation it is safe to give a unit of insulin for each gram of sugar found in the urine over a twenty-four-hour period. It may be necessary later to reduce this dose. In patients who excrete considerable diacetic acid insulin will be needed from the beginning of ob-

servation. In such cases it is usually safe to inject 20 units at once, and to make later injections of from 10 to 20 units every three to six hours until the urine becomes sugar free. The treatment of cases in acidosis is essentially like that of diabetic coma, described in Section VIII.

Timing Insulin Injections.—The time of day when insulin should be taken depends largely on the size of the dose of insulin necessary for the day. The injection should usually precede a meal by about fifteen minutes. If not more than 10 units are required for twenty-four hours these may be taken as one dose in the morning before breakfast; or, 5 units may be taken before breakfast and 5 units before supper. If more than 15 units a day are necessary, it is usually better to divide this into two equal portions and take one-half before breakfast and the other before supper. If more than 30 units are necessary, one-third of the total may be taken before each meal.

In an earlier edition of this primer it was stated that the insulin should be held constant and the composition of the diet changed as might be necessary in order to meet fluctuation in tolerance. We have now come to prefer leaving the diet unchanged and increasing or decreasing the insulin dose as may be necessary.

When insulin is being taken it is very necessary to examine the urine at least once every day and preferably twice. If sugar is found in the evening voiding, the insulin dose should be increased. An addi-

tional 3 to 5 units begun the following day may suffice; if not, another addition is indicated.

The Insulin Reaction

The danger of overdosing with insulin is less than was formerly thought, and mild reactions, which every patient taking insulin soon learns to recognize, are by no means injurious and may be even beneficial. Severe reactions should be avoided, and need never occur if the diet and insulin dose are properly balanced.

The sensations of a mild reaction are drowsiness, hunger, muscular weakness, and slight trembling. If the reaction is a little more severe, sweating occurs, the pulses bound, and the breathing becomes fast. The appearance of these symptoms indicates that the insulin dose is excessive, and a very little carbohydrate, 5 or 10 grams, should be taken at once to correct the condition. Immediate relief can be obtained with from 50 to 100 grams of orange-juice, repeated later if necessary. If such symptoms occur for two days in succession, the insulin dose for the third day should be reduced 5 or more units. If they persist after this, further reductions in the dose should be made. If, however, sugar reappears in the evening urine on reducing the dose of insulin the dose must again be raised. Sometimes it is difficult to arrive at a balance of insulin and food which will prevent reactions and at the same time keep the urine sugar free. It may then be necessary to rearrange the menus, putting

more carbohydrate into the meal which precedes the reaction, or success may be obtained by a rearrangement of the insulin injections, for instance, by taking less insulin in the dose preceding the time of the reaction and more at some other time. Occasionally it is helpful to take a small dose at 10 P.M. without food.

Severe insulin reactions will result if inadequate attention is given to the weighing of the total food for the day or when excessive amounts of insulin are taken. Such severe reactions may be dangerous. Consciousness is lost, convulsions may occur, and while sugar administered as an antidote will almost always revive the patient, reactions of this kind are not to be trifled with. This should impress everyone with the necessity for thoroughly training patients both in dietetics and in the proper use of insulin. Grave mistakes cannot be avoided otherwise.

The following two rules are of the utmost importance:

Rule 1.—If at any time the patient cannot get insulin the diet must be reduced to one-third of the usual diet. At the same time activity must be curtailed. The patient should go to bed and continue resting, on a low diet, until the insulin injections can be resumed.

Rule 2.—If for any reason a meal is missed the insulin dose should usually be omitted. However, if the urine contains sugar, a small dose of insulin, 5 or 10 units, should be taken. (See Section VII.)

SECTION VII

COMPLICATIONS AND THEIR TREATMENT

Fevers of all kinds, toxic goiter, sore throat, boil and carbuncle, and gangrene aggravate diabetes. Similarly, surgical operations, particularly those requiring anesthetics, and also serious accidents in which the flesh is badly bruised or bones are broken, are especially dangerous for diabetic patients because of their depressing influence on tolerance. This is true when diabetes is mild, as well as when it is severe, and the effect of any of these complications is sometimes so great that the mildest forms of diabetes are converted into the severest. The danger from such complications is, in fact, greater when patients have mild diabetes, because owing to its original mildness the diabetic condition may not receive the consideration it deserves. Persons with mild diabetes should remember that while they may be safe without insulin when they are otherwise well, they will probably need it to see them through complicating illnesses.

It has been difficult sufficiently to impress patients and physicians with the necessity for the heroic use of insulin during emergencies. So much has been

written concerning the danger of insulin's overaction that people have become fearful of the drug and are afraid to use it in sufficient doses when they need it most, that is, when they are sick. The patient is told that he must always take food when he takes insulin. This is correct when he is well, but incorrect when he is sick, as will be seen. Sickness comes, a fever or other complication, the appetite is lost, and the patient refuses food or perhaps vomits the food he has previously eaten. Should he take insulin? By all means! Yes! *He must have insulin, food or no food, if the urine shows sugar at these times, and particularly if it shows diacetic acid.* Otherwise he may quickly develop severe acid poisoning and fall into diabetic coma.

A patient who requires no insulin when he is otherwise well because his diabetes is mild and can be treated merely by dieting may need insulin badly when he is sick. Examination of the urine for sugar and diacetic acid will determine this point. A diabetic who requires insulin when well usually requires larger doses when sick.

Emergency Diet.—The patient's diet will need altering during the period of an illness. Heavy articles of food must be omitted and total calories must be reduced. The emergency diets (page 118) are designed for use at such times. The liquid diets are for patients who are very sick or have recently had an operation. The soft diet is for patients in less serious condition. Each of these diets, as will be seen, has a sugar value

of 100 grams, and it is important to provide this amount of sugar daily.

If the patient vomits the food, glucose should be given by rectal injection. If this is expelled, the physician may give glucose solution by vein. For rectal injection 100 grams of glucose, such as is obtainable at the drug store, is dissolved in 2 quarts of water, warmed to body temperature, and allowed to run into the rectum very slowly. The "Murphy drip" method is recommended. The physician will explain how this is carried out. One pint should be administered every six hours. For intravenous injection by the physician only the purest glucose must be used. Merck's glucose or Pfanstiehl's glucose can be recommended. This should be made into a 10 per cent solution with triply distilled water.

The daily insulin requirement during fever, or in the emergency period following an operation or an accident, may be as high or higher than 80 units a day. Larger doses than 80 units daily should rarely be given since this amount ought to protect against diabetic coma even if it does not completely clear the urine of sugar.

The insulin injections at these critical times should be made four times a day instead of three times, because the effect of this drug is shorter lived in a patient with fever or shock. An injection of 20 units (1 c.c. of U-20 Yellow label Insulin) at 7 A.M., 12 M., 5 P.M., and 10 P.M. will be as much as it is safe to give unless the patient is under the continuous observation of the

physician or of some nurse with special experience in this field. Whether to give this much or not must be decided from frequent examination of the urine.

The urine should be tested every time it is voided, and may need to be drawn by catheter if voiding is delayed longer than six hours. The amount of sugar or acid shown by each voiding must govern the decision as to the size of the next insulin dose. For instance: The morning urine contains sugar and diacetic acid, give 20 units; a sample at noon shows only a trace of sugar, give 5 units, or at most 10; a sample of urine at 6 P.M. is again loaded with sugar and diacetic acid, give 20 units; at 10 P.M. the urine is sugar free, omit insulin, etc.

If the patient's diabetes is kept under control during periods of fever and infection, his native tolerance will rise again when the complication is over, and the daily requirement of insulin will gradually diminish to what it was before he fell ill. One must be on guard during the period of convalescence and not overdo insulin. Safety lies in watching the urine at each voiding and gauging the dose by the sugar test as described above. When recovery is complete the former diet can be resumed, and usually the same insulin dose that was effective before the onset of the complication will again suffice.

SECTION VIII

DIABETIC ACIDOSIS AND COMA

These dangerous conditions are brought about when severe diabetes is permitted to go uncontrolled. Diacetic acid and two closely related chemical substances, oxybutyric acid and acetone, are formed in the body; they appear in the urine in large amounts and may be detected there by suitable tests. The simple test for diacetic acid is described in Section II. They are not formed in amounts sufficient to be harmful if the foodstuffs are properly utilized, but accumulate in dangerous quantities when for any reason the sugar derived from carbohydrates and proteins is not burned.

The chief source of these acid substances is fat. Their formation from fat is probably a normal process, and when very small amounts of sugar are burning with the fat they are promptly disposed of or rendered innocuous. They may be detected in the urine of non-diabetic persons eating a diet composed almost exclusively of fat, and will result from fasting, since the body when one is fasting derives its nourishment from its food reserves, and these are chiefly fat. They are rarely formed in dangerous amounts in the absence of

diabetes because the normal body never fails to burn some sugar, securing this from protein, and to a limited extent from fat, when deprived of carbohydrate. Even in patients with diabetes acid substances do not accumulate in dangerous amounts during fasting or from a diet rich in fat so long as the diabetes is under control and the urine is sugar free. They occur in overwhelming concentration when for any reason the patient dependent on insulin is deprived of it or when complications supervene.

Causes for Diabetic Coma

Acid poisoning or acidosis may be provoked in diabetics by excessive overeating, by surgical operations, or by complicating infectious diseases.

Overeating throws a sudden strain on the tissues of the pancreas and may thereby bring about a functional collapse. Insulin formation ceases, sugar burning ceases, and coma follows. The severest strains seem to result from the overeating of carbohydrate and protein. The usual story is one of overindulgence in sweets.

Surgical operations are always dangerous for patients who have diabetes, and should never be attempted by surgeons who have had no special experience with such cases. Anesthetics seem to depress the insulin supply; the shock from cutting, tearing, and stretching tissues has a similar effect, and infections, which sometimes follow in the wake of the most

skilfully performed operations, are poorly borne by the diabetic.

Patients with diabetes should never fail to inform their surgeons and dentists that they are afflicted with this malady, so that the necessary precautions may be taken. Even minor operations, such as the extraction of teeth and trivial manipulations, such as the removal of corns or the trimming of toe-nails, may involve serious consequences.

On the other hand, it is possible to operate in the presence of even severe diabetes without great risk if the patient is properly prepared for the ordeal, and if suitable glucose and insulin treatment is given during the critical period following the operation, as described on page 60.

Infectious diseases, with or without fever, as well as infections, such as abscesses, boils, and gangrene, are the most common provoking causes of diabetic coma, depressing tolerance and thereby favoring the formation of excessive amounts of diacetic acid.

Prevention, Recognition, and Treatment of Acidosis

The Prevention of Acidosis.—To avoid acidosis and coma the patient must obey the following rules:

1. Hold to the diet, test the urine daily, and use enough insulin to keep the urine sugar free. Never discontinue taking insulin unless advised by the physician that it is safe to do so.

2. Inform surgeon, dentist, and chiropodist of the presence of diabetes, so that proper precautions may be taken to prevent acidosis or infection from operation.

3. Avoid exposure to infectious diseases. Keep away from crowded assemblies, such as moving picture theaters, when epidemics are about. Avoid the company of persons who have colds or fever. Keep up resistance to infection by securing regular sleep and fresh air and by avoiding physical and mental fatigue. Above all, maintain a rigid control of diabetes. Carelessness in testing the urine, laxness in dieting, and the improper use of insulin result invariably in lowering resistance to infections.

The Recognition of Acidosis and Coma.—The chief symptoms of acidosis are eight in number. Not one of them alone is of any great significance, but when several of them appear together they are cause for alarm. These are:

1. Large amounts of sugar in the urine.
2. A strong diacetic acid test of the urine.
3. The odor of acetone (a fruity odor) on the breath.
4. Unusual pains in the abdomen, back, and legs.
5. Nausea and vomiting.
6. Dryness of skin and tongue.
7. Difficult, deep, and rapid breathing.
8. Somnolence, stupor, unconsciousness.

The Treatment of Acidosis and Coma.—In general, the treatment of acidosis is like the management of sickness from other causes, as described in Section VII:

1. Increase the dose of insulin. If no insulin has been taken before, secure it at once. The lack of insulin is the cause of coma. Insulin is, therefore, a specific in treating coma. The dose will vary with the severity of the case: 20 or 40 units should be given at once, and a dose of 20 units repeated every *three* hours until the urine tests are negative for sugar. The urine must be examined every few hours in order to avoid overdosage.

2. Decrease the diet. The emergency diet No. 1 should be used (page 118).

3. Secure rest, quiet, and warmth in bed.

4. Drink at least 1 quart of warm fluid every six hours, chiefly water, but include hot tea or coffee.

5. Call the doctor. He may apply some of the following measures: It is a good practice to wash out the stomach with a warm 5 per cent solution of sodium bicarbonate. Heart stimulants are helpful. Digifolin (Ciba) administered subcutaneously in doses for adults 1 c.c. every hour for six hours is of value. Sodium bicarbonate may be given in level teaspoonful doses by mouth every half-hour with 200 c.c. of water for 5 or 6 doses. A 5 per cent solution of sodium bicarbonate may be given by rectum. Not more than from 20 to 40 grams of soda is necessary. If the patient is vomiting or fails to retain enemas, water should be gotten into his body through subcutaneous injections, as physiologic salt solution. It is of extreme importance to control the dehydration of the tissues.

SECTION IX

GANGRENE AND SKIN INFECTIONS

GANGRENE of the feet is a frequent and often a fatal complication among elderly persons with diabetes. The cause of this is to be found in poor circulation of the blood, due to thickening of the walls and narrowing of the caliber of the blood-vessels (arteriosclerosis). Diabetes seems to aggravate and intensify this condition, but if the excretion of sugar is prevented conscientiously and the following measures are carried out as a daily routine by older patients much gangrene can be prevented:

1. Wash the feet with soap and water.

2. Dry thoroughly; if the feet are soft and tender, rub them with alcohol.

3. Massage for five minutes (rub feet and legs upward, pushing the blood toward the heart). For this purpose the hands should be greased with lanolin, vaselin, or olive oil.

4. Exercise the feet by rising on the toes twenty times; then lie on the bed and raise the feet to a vertical position, maintaining this position for five minutes.

5. Change to clean hose twice daily. White woolen hose free from darning are recommended.

6. Change shoes twice daily; that is, avoid wearing the same shoes for more than six hours at a time. Wear new shoes only one-half hour a day for the first week. Shoes should be roomy and flexible and must not bind or rub the feet. Beware of torn linings and nails. Wear pads over corns if necessary to distribute the pressure of the shoe.

7. For removing corns and calluses paint them with a mixture of salicylic acid (4 grams) and collodion (30 c.c.). This should be applied nightly for four nights, after which the callus or corn will usually rub off easily on thorough soaking in warm soapy water. Avoid the use of knives.

8. Cut the nails straight across and avoid cutting the flesh. If they are cut by a chiropodist he must be told to use the same precaution. If the nails are brittle or dry they should be softened before cutting by soaking in warm soapy water.

9. If the flesh is cut or bruised the part affected should be dressed with a clean bandage, kept moist with a solution of equal parts of alcohol and saturated boric-acid solution. After twelve hours the sore can be painted with 2 per cent mercurochrome and dressed with dry sterile gauze. Strong antiseptics like iodin, bichlorid, and especially carbolic acid must be avoided, as they may cause dangerous burns. The doctor should be consulted no matter how trivial the injury, unless healing is well under way within twenty-four hours.

10. Avoid all applications of heat to the feet. Hot moist dressings are usually beneficial for treating infections and are popular, but they should not be used for the feet of a patient with diabetes because of the danger of burning the skin. So also hot-water bags and electric pads in proximity to the feet are dangerous, and *x*-ray or light treatments are likely to produce bad burns. The sensitiveness of the feet of diabetics to burning is truly remarkable and has resulted in many tragedies.

Other Advice Regarding the Care of the Skin.—Diabetic patients are susceptible to boils, acne, and eczema, especially when their disease is out of control. Should these complications develop, a physician's attention should be had without delay. Dr. W. J. Mayo contributes the following excellent bit of advice: Boils of the neck and face are frequently due to infection from a barber's razor. It is well for a man with diabetes to shave himself, and when the hair is cut the barber should be told to omit the customary shaving of the neck.

SECTION X

THE PLANNING OF DIET PRESCRIPTIONS

(For the Physician)

THE planning of diet formulas for patients with diabetes involves three major considerations: (1) The total fuel or calorie value of the diet; (2) the amount of protein to be allowed; (3) the amount of carbohydrate desirable.

The Calorie Requirement.—The introduction of insulin has obviated the necessity for the very rigid restrictions formerly advocated. Undernutrition, so universally believed necessary a decade ago, is no longer considered desirable, and even the low maintenance diet suggested by the author in 1922 has now been amplified. If insulin means anything at all to the diabetic, it must enable him to eat enough to maintain his strength. On the other hand, diets which provide many more calories than are actually necessary are unquestionably injurious, since they add to the metabolic strain and thereby depress the patient's native tolerance. It becomes desirable, therefore, to estimate the calorie requirement with considerable precision for each individual case, and with adult patients at least it is more satisfactory to base this estimate on the four factors of age, sex, height, and weight rather than on weight alone as is so generally the custom.

With the aid of the nomograph following the Index (Diabetic Diet Chart I[1]) the necessary calculation can be performed with less effort than is necessary simply to multiply pounds of body weight by calories per pound. The ideal weight is spotted on Scale I[2] and the patient's actual height on Scale II. A straight-edge joining these two points locates a point on the surface area scale, Scale III. The age and sex of the patient are then spotted on Scale IV, and the straight-edge from this point to the point previously located on Scale III crosses Scale V at the required total food calories for "basal maintenance." Basal maintenance refers to food requirements at complete rest. Extra calories will be needed to cover the extra expenditure of calories during working hours, but these can be estimated with reasonable accuracy on the basis of the basal requirements. Patients who lead very sedentary lives usually hold a constant weight with an addition of 30 per cent to their basal requirement. Merchants,

[1] Chart I was prepared in 1921 by Dr. W. M. Boothby and Mr. R. B. Sandiford. It is reproduced here with the permission of Dr. Boothby. Chart II is a modification of a chart devised in 1922 by the author.

[2] In making this calculation of energy requirements it is usually desirable to base it on an ideal body weight rather than on the actual weight of the patient at the time of examination. The average height, weight, age tables (pages 126 and 127) should be consulted in this connection. While these average weights are not necessarily "ideal," they represent the best estimate of ideal weights available.

clerks, and housewives usually require a 50 per cent addition, while with laborers and farmers a 60 or 70 per cent addition may be necessary. The subsequent gain or loss of weight must determine whether or not the addition made to the basal requirement is a proper one. A falling weight calls for more calories; a gain in weight above the "ideal" necessitates some reduction in the allowance. It is never wise to permit patients with diabetes to become obese.

The Amount of Protein to Be Fed.—Excessive protein is injurious in diabetes not only because 58 per cent of all protein metabolized is converted into glucose before utilization, but because a high protein metabolism stimulates the general metabolism and thereby depresses the patient's tolerance and increases the insulin requirement. Under the circumstances it is desirable to restrict the protein quota of the diet as rigidly as is consistent with health. An allowance of 50 grams of protein a day will cover the protein needs of practically every patient. This amount provides not less than two-thirds of a gram for each kilogram of weight for large persons and at the same time is not excessive for smaller ones.

Carbohydrate Restriction.—The value of limiting carbohydrates in diabetes is almost universally acknowledged. Sugar is the chief burden on the sugar-utilizing facilities, and a lessening of this strain is an essential element of successful treatment. Insulin cannot be injected in sufficiently frequent doses to im-

itate the activity of the pancreas and entirely meet the exhausting effects of meals high in carbohydrates. On the other hand, a too rigid restriction of carbohydrate is undesirable, first, in view of considerations of the palatability of the diet; second, because such restriction might lead to injurious deprivation of vitamins and minerals; and third, because of the necessity of having some carbohydrate to promote the oxidation of fat. The fear of fat feeding in diabetes that formerly prevailed has been largely overcome by the therapeutic success of the high-fat régimes of Petren, Newburgh and Marsh, and the author, and, while there is a limit below which in practice it is undesirable to go, this limit is avoided by a large margin of safety in the diets with a glucose equivalent of 120 grams planned as described below.

The term "glucose equivalent," introduced by Woodyatt, and often referred to as the "G" of the diet, is applied to the sum of the carbohydrate grams plus 58 per cent of the protein grams plus 10 per cent of the fat grams. The small fraction of fat estimated as glucose is the glycerin combined with the fatty acid.

Calculating the Diet Prescription for Adult Patients, Including Children More than Twelve Years of Age.— The point P on Diabetic Diet Chart II represents the point 50 grams on a protein scale not otherwise shown. Any line through this point which will cut Scale C and F will give the prescription for a food mixture containing 50 grams of protein and having a glucose equivalent of 120 grams.

The total calorie requirement previously obtained from Chart I is spotted on Scale M of Chart II, and a straight-edge is laid from here through the point P. Where the line thus projected crosses the Fat Scale F and the Carbohydrate Scale C, can be read off fat grams and carbohydrate grams, which with 50 grams of protein give the desired calories and a glucose equivalent of approximately 120 grams. Sufficient carbohydrate restriction is accomplished if the "G" does not exceed 120, and the amount of carbohydrate allowed in diets planned in this manner is ample to insure an adequate vitamin and mineral supply.

There is no magic virtue in this particular glucose equivalent and no objection to increasing the carbohydrate allowance. It is even desirable to provide additional carbohydrate to patients who are unusually tall and, therefore, have proportionally large calorie requirements. My experience, however, is that greater liberality in carbohydrate almost always adds to the difficulty of maintaining perfect control of glycosuria. No sacrifice of nutrition is involved in diets such as these, in which the carbohydrate allowance is at least 70 grams, as planned with the Diabetic Diet Charts, and I, therefore, adhere to these diets in most cases. Individualization in treatment is important, but a systematic program which can be followed the majority of the time lessens the frequency of errors.

The large amount of fat in these diets is well borne when it is cooked with the vegetables or served as iced

butter. Fat is the safest source of calories in diabetes, requires little insulin to be metabolized and is a relatively inexpensive food. Two hundred and forty grams, $\frac{1}{2}$ pound, of the best butter costs thirty cents in the present retail market and provides 1836 calories. The cost of an amount of bread (700 grams) which would provide an equal number of calories would be fifteen cents, but the extra insulin necessary if 700 grams of bread were to be substituted for 240 grams of butter would make the bread, at least, twice if not three times as expensive as the butter.

The following example illustrates the use of the Diabetic Diet Chart in calculating a diet:

Example.—The patient is a farmer's wife, aged forty. Her ideal weight is 135 pounds, and she is 5 feet 3 inches in height. Turn to Chart I and spot the point 135 pounds on Scale I. Spot the point 5 feet 3 inches on Scale II, and connect these two points with a straight-edge. Locate the point of Scale III at which the straight-edge crosses that scale. Next find on Scale IV the point corresponding to the patient's age and sex. In this case it is 36 calories. With the straight-edge connect this point with the one located on Scale III. The edge crosses Scale V at the basal requirement, which in this case is 1400 calories. This should be increased by 50 per cent (since the patient is a farmer's wife), making the total food calories 2100.

Now turn to Chart II and locate 2100 on the total food calorie scale, Scale M. Extend a straight-edge

across the Chart in a line between this point and the point P. It crosses Scale C at a carbohydrate figure 73 and Scale F at a fat figure 178. The glucose equivalent of 73 grams of carbohydrate, 50 grams of protein, and 178 grams of fat is 120. $(73 + (0.58 \times 50) + (0.1 \times 178) = 120.)$

Diets for Children

With children under thirteen years of age it is best to base estimations of basal energy requirements on height and sex without regard to age and weight. The predicted total basal metabolism of boys and girls of different heights are given in tables on pages 128 and 129. These are taken from Tables of Dr. Fritz B. Talbot. The basal requirement of the child should be amplified by the addition of extra calories for activity which, depending on the liveliness of the child, will equal from 40 to 70 per cent of the basal requirement.

The proportionately greater protein requirement of children is provided for in the diets planned in Chart II, since 50 grams for a child weighing less than 110 pounds is in excess of a gram per kilogram of weight, and the smaller the child, the greater will be the excess, as is desirable. Many of the juvenile patients at the Mayo Clinic have received smaller allowances of protein than those here proposed, and few if any have failed to obtain a good growth.

It is very important to include milk in the diet of children, and the day's food allowance should be

planned to contain a pint of milk. In all other respects the planning of these diets is like that of adult patients.

Diets for Illiterate Patients

When dealing with patients who have not enjoyed the advantages of at least a grade-school education it is often impossible to teach the planning of menus as described in Section V. It becomes necessary then to resort to the much less satisfactory fixed diet. In such cases the physician must plan a series of breakfasts, dinners, and suppers, and provide the patient with these menus.

It is rarely impossible to teach even the very ignorant how to use food scales. It is also feasible, as a rule, to teach them about the division of the vegetables and fruits into the various groups, 5 per cent, 10 per cent, and so forth, and since this knowledge permits them to make certain substitutions and thus to diversify their diets to a small extent it is very helpful. If the patient is too densely ignorant, some relative must be found who can be taught how to take care of him.

Fixed diets (menus planned by a physician) must contain only the most easily obtainable foods, as otherwise the patients will be at a loss each time they are unable to secure in their market or garden the particular food specified.

The following menus will serve as illustrations. They are planned for patients with total maintenance fuel requirements of 2000, 2250, and 2500 calories, re-

Sample Diets

Diet 1.—For a patient with a total food requirement of 2000 calories:

DIET ORDER

Carbohydrates 74. Protein 50. Fat 167. Calories 2000. Sugar value 120.

Food.	Breakfast.	Dinner.	Supper.	Total grams.	Grams: Carbohydrate.	Protein.	Fat.
Vegetables, 3 per cent.	.....	250	250	500	15	5	0
Fruit, 5 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables, 6 per cent.	.....	50	50	100	6	1	0
Fruit, 10 per cent.	100	.....	100	200	20	2	0
Vegetables and fruit, 15 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables and fruit, 20 per cent.	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
Butter.	30	30	25	85	0	0	72
Bacon.	30	.....	20	50	0	5	34
Eggs.	1	.....	1	2	0	12	12
Meat.	.....	60	.....	60	0	15	9
Cream, 20 per cent.	100	.....	100	200	10	6	40
Cream, 40 per cent.	.....	.....	.....	.....	.....	.....	.....
Olive oil or other fat.	.....	.....	.....	.....	.....	.....	.....
Milk.	.....	.....	.....	.....	.....	.....	.....
Cereal (dry).	.....	.....	.....	.....	.....	.....	.....
Bread.	20	20	.....	40	22	4	0
FOOD VALUE OF THE DIET			Total grams.		73	50	167
			Calories per gm.		4	4	9
					292	200	1503

Total calories of carbo. Equals 292
Total calories of prot. Equals 200
Total calories of fat Equals 1503
Total calories Equals 1995

Breakfast

10 per cent fruit, 100 grams
Butter, 30 grams
Bacon, 30 grams
Eggs, 1
20 per cent cream, 100 grams
Bread, 20 grams

Dinner

5 per cent vegetables, 250 grams
10 per cent vegetables, 50 grams
Butter, 30 grams
Meat, 60 grams
Bread, 20 grams

Supper

5 per cent vegetables, 250 grams
10 per cent vegetables, 50 grams
10 per cent fruit, 100 grams
Butter, 25 grams
Bacon, 20 grams
Eggs, 1
20 per cent cream, 100 grams

Diet II.—For a patient with a total food requirement of 2250 calories:

DIET ORDER

Carbohydrates 70. Protein 50. Fat 196. Calories 2250. Sugar value 120.

Food.	Breakfast.	Dinner.	Supper.	Total grams.	Grams: Carbohydrate.	Protein.	Fat.
Vegetables, 3 per cent.	.....	250	250	500	15	5	0
Fruit, 5 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables, 6 per cent.	.....	50	50	100	6	1	0
Fruit, 10 per cent.	100	.....	100	200	20	2	0
Vegetables and fruit, 15 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables and fruit, 20 per cent.	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
Butter.	30	50	30	110	0	0	94
Bacon.	30	.....	30	60	0	6	40
Eggs.	1	.....	1	2	0	12	12
Meat.	.....	60	.....	60	0	15	9
Cream, 20 per cent.	100	.....	100	200	10	6	40
Cream, 40 per cent.	.....	.....	.....	.....	.....	.....	.....
Olive oil or other fat.	.....	.....	.....	.....	.....	.....	.....
Milk.	.....	.....	.....	.....	.....	.....	.....
Cereal (dry).	.....	.....	.....	.....	.....	.....	.....
Bread.	15	20	...	35	19	3	0

FOOD VALUE OF THE DIET		Carbohydrate.	Protein.	Fat.
	Total grams.	70	50	196
	Calories per gm.	4	4	9
		280	200	1764

Total calories of carbo. Equals 280
Total calories of prot. Equals 200
Total calories of fat Equals 1764
Total calories Equals 2244

Breakfast

10 per cent fruit, 100 grams
Butter, 30 grams
Bacon, 30 grams
Eggs, 1
20 per cent cream, 100 grams
Bread, 15 grams

Dinner

5 per cent vegetables, 250 grams
10 per cent vegetables, 50 grams
Butter, 50 grams
Meat, 60 grams
Bread, 20 grams

Supper

5 per cent vegetables, 250 grams
10 per cent vegetables, 50 grams
10 per cent fruit, 100 grams
Butter, 30 grams
Bacon, 30 grams
Eggs, 1
20 per cent cream, 100 grams

Diet III.—For a patient with a total food requirement of 2500 calories:

DIET ORDER

Carbohydrates 68. Protein 50. Fat 226. Calories 2500. Sugar value 120.

Food.	Breakfast.	Dinner.	Supper.	Total grams.	Grams: Carbohydrate.	Grams: Protein.	Grams: Fat.
Vegetables, 3 per cent.	.....	250	250	500	15	5	0
Fruit, 5 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables, 6 per cent.	.....	50	50	100	6	1	0
Fruit, 10 per cent.	100	.....	100	200	20	2	0
Vegetables and fruit, 15 per cent.	.....	.....	.....	.....	.....	.....	.....
Vegetables and fruit, 20 per cent.	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....
Butter.	40	75	40	155	0	0	132
Bacon.	25	.....	25	50	0	5	34
Eggs.	1	.....	1	2	0	12	12
Meat.	.....	60	.....	60	0	15	9
Cream, 20 per cent.	100	.....	100	200	10	6	40
Cream, 40 per cent.	.....	.....	.....	.....	.....	.....	.....
Olive oil or other fat.	.....	.....	.....	.....	.....	.....	.....
Milk.	.....	.....	.....	.....	.....	.....	.....
Cereal (dry).	.....	.....	.....	.....	.....	.....	.....
Bread.	10	20	.....	30	16	3	0
FOOD VALUE OF THE DIET			Total grams.		67	49	227
			Calories per gm.		4	4	9
					268	196	2043

Total calories of carbo. Equals 268
Total calories of prot. Equals 196
Total calories of fat Equals 2043
Total calories Equals 2507

Breakfast

10 per cent fruit, 100 grams
Butter, 40 grams
Bacon, 25 grams
Eggs, 1
20 per cent. cream, 100 grams
Bread, 10 grams

Dinner

5 per cent vegetables, 250 grams
10 per cent vegetables, 50 grams
Butter, 75 grams
Meat, 60 grams
Bread, 20 grams

Supper

5 per cent vegetables, 50 grams
10 per cent vegetables, 50 grams
10 per cent fruit, 100 grams
Butter, 40 grams
Bacon, 25 grams
Eggs, 1
20 per cent cream, 100 grams

spectively. The glucose equivalent in each case is 120 grams. Each meal, whether a breakfast, dinner, or supper, contains approximately one-third of the allowance of carbohydrate, protein, and fat for the day, and only the most readily obtainable foods are named.

Lists of Food Equivalents.—When dealing with a patient slow to learn diet planning, as described in Section V, the physician may fill out a diet for him after one of those shown on page 83 (that is, a diet limited to 5 and 10 per cent vegetables, 10 per cent fruits, butter, bacon, eggs, meat, cream, and bread), and then teach him that he may substitute for any of these items one or the other of the food combinations of equivalent composition contained in the Tables of Food Equivalents (pages 124 and 125). It is understood that no one of the pattern diets written out above is to be followed blindly, but that the food allowance is to be planned according to the actual food requirements of the patient; calories, basal requirement plus 30, 50 or 70 per cent, as the case may be, depending on the patient's activity, 50 grams of protein, and a total glucose equivalent of 120 grams.

SECTION XI

RECIPES

RECIPES for diabetics, especially such as call for commercial "diabetic" food preparations, are objectionable on the ground that uninstructed patients are led by them to the belief that they possess curative or, at least, remedial virtue. The recipes listed below specify no unusual foods, and are designed for the use of the patient's family as well as for the use of the patient. Their only value is that they may help to add variety to the patient's diet and that they have a predetermined composition of fat, carbohydrate, and protein.

Until the patient has acquired considerable skill in diet planning it will be difficult for him to plan recipes into his diet. He should not attempt to use them, therefore, until he is sure that he can do so without making mistakes. Until fully trained he should proceed as follows in preparing his food:

1. Weigh butter, cream, and egg allowances for the day before the first meal.

2. Remove weighed portions of cooked vegetables

and meats from the family's supply before any butter, cream, milk, egg, bread crumbs, crackers, or other "trimmings" with food value is added.

3. Prepare the removed portions as desired with butter, cream, or egg taken from the previously weighed allowance of these articles.

I am indebted to Miss Florence H. Smith for the following description of the method of preserving fruit without the addition of sugar, as well as for the very excellent recipe (Recipe 1) for soy muffins, and Recipe 2 for pop-overs. The remainder of the material in this section is taken directly from the second edition of this book, and was contributed by Miss Mary A. Foley.

Preservation of Water-packed Fruit—Cold Pack Method

Prepare jars, rubber rings, and tops as usual for any canning process. Select and prepare the fruit as usual, taking care to select firm fruit. Fill the jars with equal weights of fruit and water. Screw on the tops lightly. Sterilize the fruit and jars by placing them in a kettle or boiler of hot water. There should be a rack in the bottom of the kettle to prevent the jars from touching it. Bring the water in the boiler to the boiling-point and boil for thirty minutes. Remove the jars from the boiling water, take off the tops, and add boiling water to fill the jars to overflowing. Put

on the clean rubber rings, then put on the tops, seal, and turn upside down until cold.

Several wholesale dealers are now making an effort to supply the diabetic patient with the best grade of fruits canned without sugar, and put up in No. 2 or No. $2\frac{1}{2}$ cans. This fruit is very palatable, reasonable in price, and labeled to avoid confusion. The contents of many cans of fruit packed without sugar have been analyzed. The results are most gratifying to those of us who are interested in finding a supply of food for diabetics which is palatable, of known carbohydrate content, and containing an available supply of mineral salts plus a bland bulk. We have found it safe in this Clinic to use all water-packed fruits as containing approximately one-half the carbohydrate content of the fresh fruit. For example, a peach containing 10 per cent of carbohydrate canned in water, on analysis is found to contain approximately 5 per cent of carbohydrate, while the water and juice surrounding the fruit also contains 5 per cent of carbohydrate. Water-packed fruit canned at home may be calculated at one-half the carbohydrate content of fresh fruit if the following proportions are used:

	Carbohydrate, gm.
100 grams of fresh peaches	10
100 grams of water	0
200 grams of peaches with juice	10
100 grams of peaches with juice	5

Fruit canned without sugar keeps indefinitely. The contents of the can should be calculated at one-half the carbohydrate content of the fresh fruit regardless of whether the fruit alone is used, the juice alone, or a mixture of fruit and juice.

SOY MUFFINS—RECIPE 1

	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Baker's bran (unwashed), 30 gm.	8	3	2
Soy-bean flour, 50 gm.	4	19	8
Eggs, 4	0	24	24
Butter, 55 gm.	0	0	47
Baking powder, 1 teaspoonful	0	0	0
Salt, ½ teaspoonful	0	0	0
Water, ¾ cup	0	0	0
Food value of eight muffins	12	46	81
Food value of one muffin	1.5	6	10

Mix the dry ingredients. Melt the butter. Add water and melted butter to the dry ingredients. Separate the egg-yolks, beat, and add to the mixture. Beat the whites very stiff, and fold into the mixture. Oil eight muffin tins. Divide the mixture evenly among the eight tins. Bake in a moderate oven until browned.

Baker's bran may be purchased from any flour-mill or bought in boxes at a grocery store. Pillsbury's sterilized bran is good. Do not use bran prepared for breakfast food or any special "diabetic" bran.

The percentage composition of baker's unwashed bran is carbohydrate 27, protein 10, and fat 5.

Soy-bean flour is a meal made by grinding the soy bean.

Butter is used in muffins because of its pleasant flavor. Bacon fat or oil may be substituted.

Any standard brand of baking powder may be used.

POPOVERS—RECIPE 2

	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Flour, 42 gm.	32	3	
Eggs, 4	0	24	24
Cream (40 per cent), 120 gm.	4	2	48
Salt, ¼ teaspoonful	0	0	0
Food value of twelve popovers	36	29	72
Food value of one popover	3	2	6

Beat the egg thoroughly. Add gradually while beating the flour with which the salt has been sifted. Add the cream slowly and beat until thoroughly mixed. Pour the mixture into hot buttered muffin tins. This recipe makes twelve popovers. Bake in a very hot oven for five to eight minutes, then reduce the oven temperature, and continue the baking until the popovers are dry and crisp.

NOODLE SOUP—RECIPE 3

Broth—clear	1 cupful
Egg	1
Butter	10 gm.
Salt and pepper	a few grains

Beat egg until stiff and bake in 10 gm. of butter as an omelet; let cool, cut into strips as noodles. Heat

broth and add noodles. If desired, add vegetables, cut in cubes, using such variety and quantity as give flavor to soup; adding their food value to recipe. Food value, 6 gm. protein and 15 gm. fat.

TOMATO SOUP—RECIPE 4

Clear broth	1 cupful
Tomatoes, cooked	80 gm.
Onions, uncooked	10 "

To one cup of clear broth add 80 gm. of tomatoes and 10 gm. of onions cut fine. Cook for fifteen minutes. Season with salt and pepper and serve. Food value, 3 gm. carbohydrate and 1 gm. protein.

VEGETABLE SOUP—RECIPE 5

Clear broth	2 cupfuls
Vegetables, 5 per cent, uncooked	50 gm.
Vegetables, 10 per cent, uncooked	25 "

To two cupfuls of clear broth add 30 gm. of tomato, 10 gm. of celery, 10 gm. of cabbage, 15 gm. of onions, and 10 gm. of carrots. Cook until vegetables are tender. Season with salt and pepper. Food value, 3 gm. carbohydrate and 1 gm. protein.

NEW ENGLAND BOILED DINNER—RECIPE 6

Meat, uncooked	50 gm.
Vegetables, 5 per cent, uncooked	100 "
Vegetables, 10 per cent, uncooked	100 "
Vegetables, 15 per cent, uncooked	25 "

To 50 gm. of corned beef add three cupfuls of boiling water; simmer until the meat is tender. Remove meat, add 100 gm. of cabbage, 50 gm. of beets, 50 gm. of carrots, and 25 gm. of parsnips. Boil until tender. Add meat, reheat, and serve. Season with salt and pepper. Food value, 13 gm. carbohydrate, 13 gm. protein, and 5 gm. fat.

NEW ENGLAND BOILED DINNER—RECIPE 7

Meat, uncooked	40 gm.
Vegetables, 5 per cent, uncooked	100 "
Vegetables, 10 per cent, uncooked	100 "
Vegetables, 15 per cent, uncooked	25 "
Potato, uncooked	100 "

To 40 gm. of corned beef add three cupfuls of boiling water; simmer until meat is tender. Remove meat; add 100 gm. of cabbage, 50 gm. of turnips, 50 gm. of carrots, 25 gm. of parsnips, and 100 gm. of potato. Boil until tender. Add meat, reheat, and serve. Season with salt and pepper. Food value, 33 gm. carbohydrate, 12 gm. protein, and 4 gm. fat.

BEEF STEW—RECIPE 8

Meat, uncooked	60 gm.
Vegetables, 5 per cent, uncooked	60 "
Vegetables, 10 per cent, uncooked	50 "

To 60 gm. of meat add two and one-half cupfuls of boiling water and one-fourth teaspoonful salt, and let

simmer until tender. Remove meat from water and add 60 gm. of cabbage, 25 gm. of carrots, and 25 gm. of onions. Boil until vegetables are tender. Add meat, reheat, and serve. Season with salt and pepper. Food value, 5 gm. carbohydrate, 13 gm. protein, and 6 gm. fat.

BEEF STEW—RECIPE 9

Meat, uncooked	100 gm.
Vegetables, 5 per cent, uncooked	150 "
Vegetables, 10 per cent, uncooked	100 "

To 100 gm. of meat add three cupfuls of boiling water and one-fourth teaspoonful of salt, and let simmer until tender. Remove meat from water and add 50 gm. of cabbage, 50 gm. of tomato, 50 gm. of celery, 50 gm. of carrots, and 50 gm. of onions. Boil until vegetables are tender. Add meat, reheat, and serve. Season with salt and pepper. Food value, 11 gm. carbohydrate, 23 gm. protein, and 10 gm. fat.

SALISBURY STEAK—RECIPE 10

Round steak, fat, weighed uncooked	60 gm.
Onions, uncooked	25 "
Salt and pepper	a few grains

Grind the meat, add onion and seasoning, and make into firm balls. Sear in hot mineral oil, then cook at a lower temperature. Food value, 1 gm. carbohydrate, 12 gm. protein, and 12 gm. fat.

ROAST PORK AND APPLES—RECIPE 11

Roast pork, lean, cooked	50 gm.
Apple	75 "
Butter	10 "

Put 50 gm. of roast pork (cooked) into small dish. Cover with 75 gm. of apples sliced and 10 gm. of butter. Add a small amount of water; cover and bake in a moderate oven about twenty minutes. Food value, 11 gm. carbohydrate, 13 gm. protein, and 16 gm. fat.

CREAMED CHICKEN WITH ASPARAGUS—RECIPE 12

Chicken, cooked	50 gm.
Asparagus, cooked	100 "
Milk	80 "
Cream	20 "
Butter	5 "

Cut 50 gm. of cooked chicken into small pieces. Add 100 gm. of asparagus. Heat 80 gm. of milk, 20 gm. of cream, and 5 gm. of butter. Pour over chicken and asparagus and reheat. Season with salt and pepper. Food value, 8 gm. carbohydrate, 17 gm. protein, and 20 gm. fat..

CREAMED CHICKEN WITH ASPARAGUS AND MUSHROOMS—RECIPE 13

Chicken, cooked	30 gm.
Asparagus, cooked	50 "
Mushrooms, cooked	50 "
Milk	100 "
Cream	35 "
Butter	10 "

Mix 30 gm. of cooked chicken, 50 gm. of asparagus, and 50 gm. of mushrooms together. Heat 100 gm. of milk, 35 gm. of cream, and 10 gm. of butter. Pour over chicken, asparagus, and mushrooms; reheat and serve. Season with salt and pepper. Food value, 10 gm. carbohydrate, 13 gm. protein, and 24 gm. fat.

CHICKEN STEW—RECIPE 14

Chicken broth	1½ cupfuls
Chicken, cooked	40 gm.
Potato, uncooked	100 "
Cream	60 "
Milk	80 "
Butter	15 "
Peas	40 "

Cook 100 gm. of potato in one and one-half cupfuls of clear chicken broth; save one-half cupful of the broth and add to it 60 gm. of cream, 80 gm. of milk, and 15 gm. of butter. Heat and add the cooked potato, 40 gm. of cooked chicken, and 40 gm. of cooked peas. Season with salt and pepper. Food value, 33 gm. carbohydrate, 19 gm. protein, and 34 gm. fat.

CHICKEN SUPREME—RECIPE 15

Chicken, weighed cooked	50 gm.
Egg	½
Milk	50 "
Celery	25 "
Butter	5 "
Salt and pepper	a few grains

Beat egg slightly, add chicken and celery, cut in small pieces, milk, salt, and pepper. Put in buttered mold, set in pan of hot water, and bake in moderate oven until firm. Food value, 3 gm. carbohydrate, 17 gm. protein, and 17 gm. fat.

BAKED FISH WITH BACON—RECIPE 16

Put 50 gm. of uncooked fish in a small baking pan. Cover with 20 gm. of bacon. Bake in a moderate oven about twenty minutes. Food value, 11 gm. protein and 16 gm. fat.

BAKED FISH, SPANISH—RECIPE 17

Fish, uncooked	50 gm.
Water	½ cupful
Tomatoes, cooked	80 gm.
Onions, uncooked	10 "
Bacon	15 "

Put 50 gm. of fish in small baking dish, add one-half cupful of water, 80 gm. of cooked tomato, and 10 gm. of uncooked onions sliced fine. Cut 15 gm. of uncooked bacon into small pieces and add. Cover and bake in a moderate oven twenty minutes. Season with salt and pepper. Food value, 3 gm. carbohydrate, 12 gm. protein, and 13 gm. fat.

SALMON MOLDED—RECIPE 18

Salmon, weighed cooked	100 gm.
Egg yolk	1
Butter	5 "
Milk	50 "
Vinegar	1 tablespoonful
Salt	a few grains

Separate salmon into flakes. Add beaten yolk, melted butter, milk, vinegar, and salt. Cook over boiling water, stirring constantly until mixture thickens. Fill individual molds, chill, and serve with cucumber sauce. Food value, 3 gm. carbohydrate, 26 gm. protein, and 25 gm. fat.

CREAMED EGGS—RECIPE 19

Egg	1
Egg yolk	1
Milk	100 gm.
Cream	30 "
Butter	10 "

Cut one hard-boiled egg and the yolk of another hard-boiled egg into pieces and add them to 100 gm. of milk, 30 gm. of cream, and 10 gm. of butter which have been mixed together and heated. Season with salt and pepper. Food value, 6 gm. carbohydrate, 12 gm. protein, and 30 gm. fat.

BAKED EGG AND TOMATO—RECIPE 20

Tomato, uncooked	100 gm.
Egg	1
Butter	10 "

Scoop out the center of a raw tomato that weighs 100 gm.; drop the egg into the tomato; cover with the scooped-out tomato pulp. Add 10 gm. of butter. Season with salt and pepper and bake about fifteen minutes in a moderate oven. Food value, 3 gm. carbohydrate, 7 gm. protein, and 15 gm. fat.

POACHED EGG AND TOMATO—RECIPE 21

Tomato, cooked	100 gm.
Egg	1

Put 100 gm. of cooked tomato in a small pan; when the tomato is boiling drop the egg into the center. Remove the pan to a cooler part of the stove and let stand until the egg-white is firm and a film forms over the yolk. Season with salt and pepper and serve. Food value, 3 gm. carbohydrate, 7 gm. protein, and 6 gm. fat.

EGG WITH TOMATO SAUCE—RECIPE 22

Egg, hard cooked	1
Pale American cheese	10 gm.
Tomato, cooked	50 "
Butter	5 "
Salt and pepper	a few grains

Mash egg yolk and mix with salt and pepper. Chop egg-white fine and put in the bottom of a buttered baking dish. Then add the yolk. Cover with cooked tomato and sprinkle cheese on top. Bake long enough to melt cheese. Serve hot. Food value, 2 gm. carbohydrate, 9 gm. protein, and 14 gm. fat.

BAKED EGG WITH CHEESE—RECIPE 23

Egg	1
Cream	15 gm.
Pale American cheese	25 "
Butter	5 "

Butter a small dish with 5 gm. of butter. Add the egg, 15 gm. of cream, and 25 gm. of cheese grated fine. Bake in moderate oven until cheese is melted. Food value, 1 gm. carbohydrate, 14 gm. protein, and 22 gm. fat.

CHEESE CUSTARD—RECIPE 24

Egg	1
Cold water	2 tablespoonfuls
Butter, melted	10 gm.
Cream	50 "
Pale American cheese	20 "
Salt and pepper	a few grains

Beat egg slightly, add cold water, cream, butter, grated cheese, salt, and pepper. Put into a buttered baking dish and bake in a moderate oven until firm. Food value, 3 gm. carbohydrate, 13 gm. protein, and 32 gm. fat.

DEVILED EGG—RECIPE 25

Egg, hard cooked	1
Lemon juice	5 gm.
Melted butter	10 "
Mustard	a few grains
Paprika	" "
Salt and pepper	" "

Cut egg in halves (lengthwise). Mix yolk thoroughly with seasonings and melted butter. Refill white. Food value, 1 gm. carbohydrate, 6 gm. protein, and 15 gm. fat.

SCALLOPED EGG WITH COTTAGE CHEESE—RECIPE 26

Cottage cheese	40 gm.
Egg, hard cooked	1 "
Milk	40 "
Butter	10 "
Salt and pepper	a few grains

Put into a small buttered casserole a layer of sliced egg and alternate with cottage cheese. Add salt and pepper, cover with milk, and bake in a moderate oven about ten minutes. Food value, 4 gm. carbohydrate, 16 gm. protein, and 16 gm. fat.

COTTAGE CHEESE OMELET—RECIPE 27

Eggs	2
Milk	10 gm.
Cottage cheese	25 "
Salt and pepper	a few grains

Add milk to egg yolks and beat until thick and lemon colored. Then add cheese, salt and pepper, and fold in stiffly beaten egg-whites. Bake as ordinary omelet. Food value, 2 gm. carbohydrate, 17 gm. protein, and 13 gm. fat.

VEGETABLE OMELET—RECIPE 28

Eggs	2
Vegetable, 5 per cent, asparagus or tomato, cooked	25 gm.
Water	1 tablespoonful
Salt and pepper	a few grains

Add water, salt, and pepper to egg yolks and beat until yolks are thick and lemon colored. Then add vegetable and stiffly beaten egg-whites. Bake as ordinary omelet. Food value, 1 gm. carbohydrate, 12 gm. protein, and 12 gm. fat.

CABBAGE SOUFFLE—RECIPE 29

Cabbage, cooked	100 gm.
Lean meat, cooked, minced	15 "
Sour cream	35 "
Egg	1
American cheese	10 "
Salt and pepper	a few grains

Chop cabbage fine, add meat, cream, beaten egg, salt, and pepper. Put into mold and sprinkle grated cheese over top. Bake in a moderate oven until firm

and brown. Food value, 5 gm. carbohydrate, 15 gm. protein, and 19 gm. fat.

BAKED CAULIFLOWER WITH CHEESE—RECIPE 30

Cauliflower, cooked	150 gm.
Tomato, cooked	100 "
Cheese	25 "
Butter	10 "

Butter a small dish with 10 gm. of butter. Add 150 gm. of cauliflower cooked, 100 gm. of tomato, and 25 gm. of pale American cheese grated. Bake in moderate oven twenty minutes; 150 gm. of cabbage may be substituted for 150 gm. of cauliflower. Food value, 8 gm. carbohydrate, 10 gm. protein, and 17 gm. fat.

BAKED ONION—RECIPE 31

Onions, uncooked	50 gm.
Ground meat, lean, cooked	10 "
Milk	15 "
Butter	5 "
Salt and pepper	a few grains

Parboil the onion, scrape out the inside, leaving only the shell. Weigh shell and scrapings to 50 gm. Add meat, butter and seasoning, and return to shell. Put into casserole, add milk, and bake until tender. Food value, 4 gm. carbohydrate, 4 gm. protein, and 6 gm. fat.

SPINACH PUDDING—RECIPE 32

Spinach, cooked	100 gm.
Egg	1
Ham (cooked and minced)	25 "
Cream	35 "
Butter	10 "
Onion juice	3 drops
Nutmeg	a few grains
Salt	" "

Beat the egg, add spinach, ham, cream, onion juice, nutmeg, and salt. Put into buttered mold and bake in moderate oven until firm and brown. Food value, 5 gm. carbohydrate, 13 gm. protein, and 27 gm. fat.

SQUASH SOUFFLE—RECIPE 33

Milk	50 gm.
Squash, cooked	100 "
Egg	1
Butter	5 "
Salt and pepper	a few grains

Stir milk slowly into squash, add beaten egg yolk, salt, and pepper. Fold in beaten egg-white. Put into small buttered baking dish and bake in a moderate oven until firm. Food value, 8 gm. carbohydrate, 8 gm. protein, and 12 gm. fat.

FRIED TOMATOES WITH BACON—RECIPE 34

Bacon, cut thin	20 gm.
Tomato, uncooked	100 "
Salt and pepper	a few grains

Fry bacon until crisp, remove from pan, and add tomato cut in ½-inch slices. Fry until tomato is tender. If more grease is needed, add mineral oil. Serve hot with bacon. Food value, 3 gm. carbohydrate, 3 gm. protein, and 13 gm. fat.

CREAMED POTATO—RECIPE 35

Potato, cooked	100 gm.
Cream	30 "
Milk	30 "
Butter	10 "

Mix 30 gm. of cream, 30 gm. of milk, and 10 gm. of butter, and heat. Add 100 gm. of cooked potato, diced. Season with salt and pepper and serve. Food value, 23 gm. carbohydrate, 4 gm. protein, and 16 gm. fat.

WILTED LETTUCE—RECIPE 36

Lettuce	50 gm.
Bacon, cut fine	30 "
Cream	15 "
Vinegar	10 "
Salt	⅛ teaspoonful
Pepper	a few grains

Cut bacon in small pieces and cook until crisp. Add cream to hot bacon grease and then the vinegar, salt, and pepper. Cook together for one minute, then pour over lettuce. Serve at once. Food value, 3 gm. carbohydrate, 4 gm. protein, and 23 gm. fat.

WILTED LETTUCE WITH EGG YOLK—RECIPE 37

Lettuce	30 gm.
Bacon	30 "
Egg yolk	1
Vinegar	1 tablespoonful
Salt and pepper	a few grains

Cut bacon into small pieces and fry until crisp, add egg yolk, and scramble. Then add vinegar and pour mixture over lettuce. Food value, 1 gm. carbohydrate, 5 gm. protein, and 26 gm. fat.

TOMATO JELLY SALAD—RECIPE 38

Tomato, cooked	100 gm.
Onions, uncooked	10 "
Allspice	$\frac{1}{8}$ teaspoonful
Cloves	$\frac{1}{8}$ "
Gelatin	2 gm.
Salt and pepper	a few grains

Cook 100 gm. of tomato, 10 gm. of onions, and $\frac{1}{8}$ teaspoonful of allspice and $\frac{1}{8}$ teaspoonful of cloves for five minutes. Strain through cheese-cloth and add enough water to make $\frac{3}{4}$ cupful. Soak 2 gm. of gelatin in $\frac{1}{4}$ cupful of cold water and then add hot tomato juice. Chill and serve. Food value, 4 gm. carbohydrate and 3 gm. protein.

TOMATO ASPARAGUS SALAD—RECIPE 39

Gelatin	3 gm.
Water	1 tablespoonful
Tomato, cooked	90 gm.
Asparagus, cooked	10 "

Soak the gelatin in cold water and dissolve in hot strained tomato. Add seasoning, put in mold, and when nearly set, put asparagus in with tips standing up. Food value, 3 gm. carbohydrate and 5 gm. protein.

VARIETY SALAD—RECIPE 40

Gelatin	6 gm.
Cold water	½ cupful
Vinegar, hot	¾ "
Boiling water	¾ "
Salt	½ teaspoonful
Celery, uncooked, cut fine	50 gm.
Cabbage, uncooked, cut fine	50 "
Green peppers, cut fine	20 "
Lettuce, cut fine	10 "

Soak gelatin in cold water, add vinegar, boiling water, and salt. When liquid has cooled, add other ingredients. Mold and chill. This recipe makes four servings. Food value, 5 gm. carbohydrate and 7 gm. protein.

CHEESE AND TOMATO SALAD—RECIPE 41

Tomato, uncooked	100 gm.
American cheese	25 "
Olive oil	5 "
Salt and pepper	a few grains
Vinegar	½ teaspoonful

Scrape out tomato, mix with grated cheese. Add the oil and seasoning; refill the tomato and serve on 10 gm.

of lettuce. Food value, 3 gm. carbohydrate, 8 gm. protein, and 14 gm. fat.

EGG AND CUCUMBER SALAD—RECIPE 42

Egg, hard cooked	1
Cucumber, uncooked	50 gm.

Cut egg and cucumber in thin slices, arrange in circle (alternating egg and cucumber), having slices overlap each other. Fill in center with parsley or water-cress. Serve with 10 gm. mayonnaise dressing (Recipe 51). Food value, 2 gm. carbohydrate, 7 gm. protein, and 14.5 gm. fat.

GREEN PEPPER STUFFED WITH COTTAGE CHEESE—RECIPE 43

Green pepper	22 gm.
Cottage cheese	20 "
Paprika and salt	a few grains

Remove seed from the inside of green pepper. Weigh. Fill with cheese that has been well blended with seasoning. Chill. Cut in slices and serve. Food value, 2 gm. carbohydrate and 5 gm. protein.

HINDU SALAD—RECIPE 44

Lettuce, shredded	25 gm.
Tomato, uncooked	100 "
Celery, uncooked, cut fine	15 "
Water-cress, cut fine	10 "

Arrange lettuce on plate, cut tomato into four slices. On two slices put celery and on the other two the watercress. Serve with 10 gm. mayonnaise (Recipe 51). Food value, 5 gm. carbohydrate, 2 gm. protein, 8.5 gm. fat.

FROZEN TOMATO SALAD—RECIPE 45

Tomatoes, cooked	100 gm.
Salt and pepper	a few grains

Season and strain tomatoes. Fill a small tin with mixture, cover with oiled paper, then with a tight fitting cover. Pack in equal portions of ice and salt. Let stand two hours. Remove from mold and serve on lettuce leaf with 10 gm. mayonnaise (Recipe 51). Food value, 3 gm. carbohydrate, 1 gm. protein. 8.5 gm. fat.

STUFFED TOMATO SALAD—RECIPE 46

Tomato, uncooked	100 gm.
Celery, uncooked, cut fine	25 "
Mayonnaise dressing (Recipe 51)	10 "
Lettuce	10 "
Salt and pepper	a few grains

Cut off top of tomato, scoop out center. Mix the pieces of tomato, celery, salt, pepper, and mayonnaise. Return to tomato and serve on lettuce leaf. Food value, 4 gm. carbohydrate, 1 gm. protein, and 8.5 gm. fat.

CABBAGE AND TOMATO SALAD—RECIPE 47

Cabbage, uncooked	30 gm.
Tomatoes, uncooked	60 "
Lettuce	10 "

Chop cabbage rather fine, cut tomatoes into cubes. Mix together and serve on 10 gm. of lettuce. Serve with 10 gm. mayonnaise (Recipe 51). Food value, 3 gm. carbohydrate, 1 gm. protein, and 8.5 gm. fat.

JAPANESE SALAD—RECIPE 48

Lettuce, shredded	10 gm.
Orange	50 "
Tomatoes, fresh	25 "
Pineapple, fresh	50 "
Cream	25 "

Mix and chill, add a little vinegar to cream, pour over salad. Food value, 12 gm. carbohydrate, 2 gm. protein, and 5 gm. fat.

CABBAGE AND APPLE SALAD—RECIPE 49

Cabbage, shredded	40 gm.
Apple, cut fine	30 "
Lettuce	10 "

Mix shredded cabbage and apple together and serve on lettuce with 10 gm. mayonnaise (Recipe 51). Food value, 6 gm. carbohydrate, 1 gm. protein, and 8.5 gm. fat.

WALDORF SALAD—RECIPE 50

Apple	30 gm.
Celery	20 "
Walnuts	10 "
Lettuce	10 "

Cut apples, celery, and nuts into small pieces, mix with 10 gm. mayonnaise (Recipe 51), and serve on lettuce. Food value, 7 gm. carbohydrate, 7 gm. protein, and 14.5 gm. fat.

MAYONNAISE DRESSING WITH OLIVE OIL—RECIPE 51

Egg yolk	1
Olive oil	180 gm.
Vinegar	1 tablespoonful
Salt	1 teaspoonful
Pepper	a few grains

Beat the egg yolk until thick. Add oil drop by drop, beating all the time. Then add little vinegar, then oil slowly, then vinegar, as necessary. Add salt and pepper. Have all ingredients cold. Food value, 2 gm. protein and 186 gm. fat. Food value each 10 gm., 8.5 gm. fat.

FRENCH DRESSING—RECIPE 52

Olive oil	15 gm.
Vinegar	5 "
Salt and pepper	a few grains

Add oil slowly to vinegar, salt, and pepper. Beat well. Food value, 15 gm. fat. If mineral oil is sub-

stituted for the olive oil, this dressing will have no food value.

HOLLANDAISE SAUCE—RECIPE 53

Egg yolk	1
Cream	35 gm.
Butter	5 "
Salt and pepper	a few grains
Lemon juice	10 gm.

Beat egg yolk, add cream and butter. Cook in double boiler until thick, stirring constantly, add salt and pepper. Add lemon juice before serving. Food value, 2 gm. carbohydrate, 3 gm. protein, and 17 gm. fat.

CUCUMBER SAUCE—RECIPE 54

Cucumber, uncooked	50 gm.
Cream, 40 per cent	20 "
Vinegar	1 teaspoonful
Salt and pepper	a few grains

Chop and drain cucumber. Whip cream, then add cucumbers, salt, pepper, and vinegar. Food value, 2 gm. carbohydrate, 1 gm. protein, and 8 gm. fat.

TOMATO SAUCE—RECIPE 55

Tomatoes, cooked	100 gm.
Butter	10 "
Salt	a few grains
Paprika	" "

Strain tomato; heat until enough water has evaporated so that the sauce is thick, add seasonings, and cook until well blended. Food value, 3 gm. carbohydrate, 1 gm. protein, and 8 gm. fat.

ORANGE SAUCE—RECIPE 56

Orange juice	25 gm.
Water	¼ cupful
Egg yolk	1
Almonds, ground	5 gm.

Mix orange juice, water, and egg yolk. Cook until thick in double boiler; add ground almonds. Food value, 4 gm. carbohydrate, 3 gm. protein, and 9 gm. fat.

FRENCH TOAST—RECIPE 57

Bread	35 gm.
Egg	½
Milk	50 "
Salt	a few grains

Beat one-half egg until thick and lemon colored. Add milk and salt. Mix well. Dip bread in mixture and fry in mineral oil. If diet allows, bread may be fried in 10 gm. of butter, increasing the fat 8 gm. Food value, 21 gm. carbohydrate, 8 gm. protein, and 6 gm. fat.

PURITY CUSTARD—RECIPE 58

Egg-white	1
Salt	⅛ teaspoonful
Vanilla	a few drops
Milk	100 gm.

Beat the egg-white with a fork. Add the salt, a few drops of vanilla, and the milk. Mix well. Pour into a custard cup placed in a dish of water, and bake in a moderate oven. Food value, 5 gm. carbohydrate, 7 gm. protein, and 4 gm. fat.

CUSTARD—RECIPE 59

Egg	1
Egg yolk	1
Salt	⅛ teaspoonful
Vanilla	a few drops
Milk	100 gm.
Cream	30 "

Beat the egg and egg yolk with a fork. Add the salt, a few drops of vanilla, milk, and cream. Mix well. Pour into a custard cup placed in a dish of water, and bake in a moderate oven. If desired, saccharin may be added. Food value, 7 gm. carbohydrate, 12 gm. protein, and 22 gm. fat.

CUSTARD—RECIPE 60

Egg	1
Salt	a few grains
Vanilla	a few drops
Milk	100 gm.
Cream	40 "

Beat the egg. Add salt, a few drops of vanilla, saccharin if desired, milk, and cream. Mix well. Pour into a custard cup placed in a dish of water, and bake

in a moderate oven. Food value, 7 gm. carbohydrate, 10 gm. protein, and 18 gm. fat.

JUNKET—RECIPE 61

Milk	100 gm.
Cream	35 "
Junket	¼ tablet
Cold water	1 tablespoonful
Vanilla	a few drops

Heat milk and cream until lukewarm, or 100° F. Dissolve the junket tablet in the cold water. Add the dissolved junket tablet and a few drops of vanilla to the lukewarm milk. Stir quickly several times; pour into custard cups and let stand in a warm place until set; then place in refrigerator. Food value, 7 gm. carbohydrate, 4 gm. protein, and 11 gm. fat.

JUNKET—RECIPE 62

Milk	80 gm.
Cream	20 "
Junket	¼ tablet
Cold water	1 tablespoonful
Vanilla	a few drops

Prepare as Recipe 61. Food value, 5 gm. carbohydrate, 3 gm. protein, and 7 gm. fat.

RASPBERRY JELLY—RECIPE 63

Gelatin	8 gm.
Cold water	1 cupful
Boiling water	3 cupfuls
Raspberry flavoring	2 tablespoonfuls
Saccharin	1 grain

Soak the gelatin in cold water for five minutes. Then add boiling water, raspberry flavoring, and saccharin. Put in a cold place to jell. This recipe makes six servings. Food value of recipe, 7 gm. protein.

SNOW PUDDING—RECIPE 64

Gelatin	½ teaspoonful
Cold water	1 "
Boiling water	2 tablespoonfuls
Egg-white	1 tablespoonful
Lemon juice	1 teaspoonful
Saccharin	½ grain

Soak the gelatin in cold water, dissolve in boiling water, and let cool. Add lemon juice to gelatin, then fold in stiffly beaten egg-white and saccharin dissolved in 1 teaspoonful of cold water. Beat until stiff. Mold and chill. Food value, 4 gm. protein.

COFFEE JELLY—RECIPE 65

Gelatin	8 gm.
Cold water	1 cupful
Boiling coffee	3 cupfuls
Saccharin	1 grain

Soak the gelatin in cold water. Add the boiling coffee and saccharin. Stir the gelatin until it is dissolved. Mold and chill. This will make about six servings. Food value of recipe, 7 gm. protein.

COFFEE BAVARIAN—RECIPE 66

Gelatin	3 gm.
Cold water	40 "
Clear coffee, boiling	100 "
Saccharin	1 grain
Egg-white	1

Soak the gelatin in cold water. Add the boiling coffee and saccharin. When jelly begins to thicken, fold in egg-white beaten stiff. Chill. This recipe makes one serving. Food value, 7 gm. protein.

ICE-CREAM—RECIPE 67

Cream, 40 per cent	100 gm.
Water	½ tablespoonful
Egg	1
Saccharin	½ grain
Vanilla extract	½ teaspoonful

Beat the yolk of egg until very light, add cream slowly. Fold in beaten white of egg. Then add vanilla and saccharin which has been dissolved in ½ tablespoonful of water. Freeze. Food value, 3 gm. carbohydrate, 8 gm. protein, and 46 gm. fat.

COFFEE MOUSSE—RECIPE 68

Gelatin	30 gm.
Cold water	¼ cupful
Boiling water	¼ "
Strong coffee, boiling	¾ "
Saccharin	½ grain
Cream, 40 per cent	100 gm.

Soak gelatin in cold water, add boiling water, then coffee. Cool and add saccharin, which has been dissolved in 1 teaspoonful of cold water. When mixture begins to set, add whipped cream and whip all together. Put in mold and chill. Food value, 3 gm. carbohydrate, 5 gm. protein, and 40 gm. fat.

PRUNE WHIP—RECIPE 69

Prunes, weighed cooked	35 gm.
Cream, 40 per cent	20 "

Stone the prunes and mash; fold into whipped cream; chill and serve. Food value, 8 gm. carbohydrate, 1 gm. protein, and 8 gm. fat.

SPICE COOKIES—RECIPE 70

Eggs	2
Saccharin	½ grain
Cream	10 gm.
Spices, cinnamon, cloves, nutmeg	1 teaspoonful
Almonds, ground	20 gm.

Beat the yolks, add saccharin dissolved in cream, then spices and ground almonds. Add to the stiffly beaten whites. Drop from spoon on oiled pan and bake in hot oven. Food value, 4 gm. carbohydrate, 16 gm. protein, and 25 gm. fat.

ALMOND MACAROONS—RECIPE 71

Almonds, cut fine	20 gm.
Egg-whites	2
Saccharin	½ grain

Dissolve saccharin in a few drops of water, beat the egg-whites to a stiff froth, stir in the almonds and saccharin; bake in a very moderate oven on waxed paper. Food value of 12 macaroons, 3 gm. carbohydrate, 12 gm. protein, and 11 gm. fat.

SECTION XII

EMERGENCY DIETS, FOOD TABLES, OTHER TABLES

Emergency Diets (See page 59)

Orange Juice Diet—Sugar Value 100 Grams

Time.			Gm.		Gm.	Total carbohydrate, gm.
8 a.m.	Orange	juice	100	Sugar	10	20
10 a.m.	"	"	100			10
12 noon	"	"	100			10
2 p.m.	"	"	100	Sugar	10	20
4 p.m.	"	"	100			10
6 p.m.	"	"	100	Sugar	10	20
8 p.m.	"	"	100			10

Milk Diet—Sugar Value 100 Grams

Time			Gm.
8 a.m.	Skimmed	milk	200
10 a.m.	"	"	200
12 noon	"	"	250
2 p.m.	"	"	200
4 p.m.	"	"	200
6 p.m.	"	"	250
8 p.m.	"	"	200

Buttermilk may be substituted for the skimmed fresh milk if preferred.

Soft Diet—Sugar Value 100 Grams		Gm.
Breakfast:	10 per cent fruit juice	50
	Toast	10
	Butter	10
	Soft cooked egg	1
	Dry cereal	10
	Cream (20 per cent fat)	50
10.00 a.m.:	Milk	150
Noon:	Cream soup made with 5 per cent vegetable purée	66
	Milk	100
	Toast	10
	Butter	10
	Cream (20 per cent fat)	25
	10 per cent fruit	50
3.00 p.m.:	Milk	150
Supper:	Toast	10
	Butter	10
	Soft cooked egg	1
	Cream (20 per cent fat)	25
	10 per cent fruit	50
8.00 p.m.:	10 per cent fruit juice	70

This diet contains approximately:

Carbohydrate	73
Protein	35
Fat	74
Calories	1131

Tables of Food Values

The following classification of vegetables and fruits by carbohydrate content is by Dr. Frank Allan. It follows closely one first made by Dr. E. P. Joslin.

TABLE I

Vegetables

5 per cent. (Only 3 per cent available.)	10 per cent. (Only 6 per cent available.)	15 per cent.	20 per cent.
Cucumbers	Pumpkin	Green peas	Potato
Lettuce	Turnip	Artichokes	Shelled beans
Spinach	Kohl-rabi	Parsnips	Canned lima beans
Asparagus	Squash		Hominy
Endive	Beets		Boiled rice
Sauerkraut	Carrots		Macaroni
Beet greens	Onions		Corn
Dandelion greens	Rutabagas		
Swiss chard	French artichokes		
Celery			
Tomato			
Brussels sprouts			
Water cress			
Cauliflower			
Eggplant			
Cabbage			
Radishes			
String beans			
Mushrooms			
Summer squash			

Fruits

5 per cent.	10 per cent.	15 per cent.	20 per cent.
Rhubarb (fresh)	Grapefruit	Apple	Plums
Apricots (canned without sugar)	Lemons	Pears	Banana
Cherries	Oranges	Apricots	Prunes
Red (canned without sugar)	Cranberries	Blueberries	Grapes
White (canned without sugar)	Strawberries	Cherries	
Loganberries (canned without sugar)	Blackberries	Currants	
Blackberries (canned without sugar)	Gooseberries	Raspberries	
Peaches (canned without sugar)	Peaches	Huckleberries	
Raspberries (canned without sugar)	Pineapple		
Strawberries (canned without sugar)	Watermelon		
	Pineapple (canned without sugar)		
	Pears (canned without sugar)		
	White grapes (canned without sugar)		

Fruits canned without sugar have one-half the carbohydrate content of fresh fruits if an equal amount of fruit and water are used in canning.[1]

Reckon the available carbohydrate in the vegetables of the 5 per cent group as 3 per cent, of the 10 per cent groups as 6 per cent. All of the vegetables in these two groups contain less than 5 or 10 per cent carbohydrate, respectively. The carbohydrates in the other vegetables, together with that of the fruits, should be reckoned as listed.

In the process of cooking, foods lose both in weight and in carbohydrate content, due to the loss of water and carbohydrate which is dissolved out. These losses approximately balance each other, so that these foods may be weighed either fresh or after cooking, provided the water in which they are cooked is discarded. When they are served in the water in which they are cooked, as in the case with stewed rhubarb, vegetable soups, and stewed fruits, they should be weighed fresh.

[1] See page 86 for method of preserving fruit without addition of sugar.

TABLE II

Vegetables and fruits:	Composition. Each 100 grams contains: Carbohydrate.	Protein.	Fat.
5 per cent vegetables	3	1	0
10 per cent vegetables	6	1	0
15 per cent vegetables	15	2	0
Shelled green peas	15	7	0
20 per cent vegetables:			
Potato	20	2	0
Beans shelled	20	7	0
Green corn	20	3	1
10 per cent fruits	10	1	0
15 per cent fruits	15	1	0
20 per cent fruits	20	1	0
Green olives	2	1	10
Ripe olives	4	..	20
Olive and other oils	0	0	100
Nuts:			
Butternuts	3	28	61
Brazil nuts	7	17	67
Hickory nuts	11	15	67
Black walnuts	12	28	56
Pecans	13	11	71
Filberts	13	15	60
Beechnuts	13	22	57
English walnuts	16	17	63
Almonds	17	21	55
Peanuts[1]	6	31	50
Chestnuts	42	6	5
Soy beans	8	38	15
Cereals and breadstuffs:			
Oatmeal (weighed dry)	67	16	7
White bread	53	9	2
Whole wheat bread	49	10	1
Rye bread	53	9	1
Wheat flour	76	8	1

[1] Analysis made by Dr. M. H. Powers, Mayo Clinic.

TABLE II (Continued)

	Composition. Each 100 grams contains:		
Dairy products:	Carbohydrate.	Protein.	Fat.
Whole milk	5	3	4
Skimmed milk	5	3	1
Cream, 16 per cent fat	5	3	16
Cream, 20 per cent fat	5	3	20
Cream, 40 per cent fat	3	2	40
Buttermilk	5	3	4
Koumiss	5	3	2
Butter	0	0	85
Cheese, American (pale)	0	29	36
Cheese, American (red)	0	30	38
Cheese, cottage	4	21	1
Cheese, Swiss	1	28	35
Eggs, each	0	6	6
Egg-white (one)	0	4	0
Egg yolk (one)	0	2	6
Meats and fish:			
Meat, lean, fresh	0	20	10
Meat, lean, cooked	0	25	15
Beef, roast, fat, cooked	0	22	29
Meat, bacon, lean	0	16	43
Fish, halibut, lake trout, perch, whitefish	0	18	5
Fish, salmon, fresh or canned	0	22	13
Oysters	4	6	1
Bacon, fat	0	10	67
Lard, tallow, oleomargarine, crisco	0	0	85–100
Olive oil, cod-liver oil	0	0	100

For more complete tables consult Atwater, W. A., and Bryant, A. P., "The Chemical Composition of American Food Materials," Bulletin No. 28, U. S. Dept. of Agriculture. This publication may be obtained by sending ten cents in coin to the Superintendent of Documents, U. S. Dept. of Agriculture, Washington, D. C.

Food Equivalents

Substitutes for 10 Grams of Butter

Food.	Amount, gm.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Butter	10	0	0	8.5
Mayonnaise	10	0	0	8.5
Salad oil, crisco, lard	8.5	0	0	8.5
Bacon	13.0	0	1	8.5

Substitutes for 1 Egg

	Amount, gm.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
Egg 1	1	0	6	6
Lean beef, fat not eaten	30	0	6	3
Butter	3	0	0	3
Shrimps	25	0	6	0
Olive oil	6	0	0	6
Boiled ham	33	0	6	6
Lobster	33	0	6	0
Butter	6	0	0	6
Beef's tongue	25	0	5	3
Brazil nuts or walnuts	5	0	1	3
Dried beef	20	0	5	1
Butter	5	0	0	5
Sardines in oil	25	0	6	5
Calf brains	66	0	6	6
Sweetbreads	33	0	6	4
Butter	2	0	0	2
Cheese, American pale, American red, or Swiss	20	0	6	6

Substitutes for 10 Grams Bread

	Amount, gm.	Carbohydrate, gm.	Protein, gm.	Fat, gm.
White bread	10	5	1	0
Whole wheat bread	10	5	1	0
Graham bread	10	5	1	0
Rye bread	10	5	1	0
Wheat flour	7	5	1	0
Uneeda biscuit—each	...	5	1	0
Buttermilk	100	5	3	1
Skimmed sweet milk	100	5	3	0
Dry cereals (oatmeal, cream-wheat, rice)	7	5	1	0
Fruit, 20 per cent	25	5	0	0
Fruit, 15 per cent	33	5	0	0
Fruit, 10 per cent	50	5	1	0
Fruit, 10 per cent (water packed)	100	5	1	0
Vegetables: potatoes, beans shelled, green corn	25	5	1	0
Vegetables: green peas, parsnips	33	5	1	0
Vegetables, 10 per cent	85	5	1	0
Vegetables, 5 per cent	170	5	1	0

With the help of the food tables one can figure out any number of these equivalents.

BUILD—MEN

GRADED AVERAGE WEIGHT

Age	5 Ft.	5 Ft. 1 In.	5 Ft. 2 In.	5 Ft. 3 In.	5 Ft. 4 In.	5 Ft. 5 In.	5 Ft. 6 In.	5 Ft. 7 In.	5 Ft. 8 In.	5 Ft. 9 In.	5 Ft. 10 In.	5 Ft. 11 In.	6 Ft.	6 Ft. 1 In.	6 Ft. 2 In.	6 Ft. 3 In.	6 Ft. 4 In.	6 Ft. 5 In.
15	107	109	112	115	118	122	126	130	134	138	142	147	152	157	162	167	172	177
16	109	111	114	117	120	124	128	132	136	140	144	149	154	159	164	169	174	179
17	111	113	116	119	122	126	130	134	138	142	146	151	156	161	166	171	176	181
18	113	115	118	121	124	128	132	136	140	144	148	153	158	163	168	173	178	183
19	115	117	120	123	126	130	134	138	142	146	150	155	160	165	170	175	180	185
20	117	119	122	125	128	132	136	140	144	148	152	156	161	166	171	176	181	186
21	118	120	123	126	130	134	138	141	145	149	153	157	162	167	172	177	182	187
22	119	121	124	127	131	135	139	142	146	150	154	158	163	168	173	178	183	188
23	120	122	125	128	132	136	140	143	147	151	155	159	164	169	175	180	185	190
24	121	123	126	129	133	137	141	144	148	152	156	160	165	171	177	182	187	192
25	122	124	126	129	133	137	141	145	149	153	157	162	167	173	179	184	189	194
26	123	125	127	130	134	138	142	146	150	154	158	163	168	174	180	186	191	196
27	124	126	128	131	134	138	142	146	150	154	158	163	169	175	181	187	192	197
28	125	127	129	132	135	139	143	147	151	155	159	164	170	176	182	188	193	198
29	126	128	130	133	136	140	144	148	152	156	160	165	171	177	183	189	194	199
30	126	128	130	133	136	140	144	148	152	156	161	166	172	178	184	190	196	201
31	127	129	131	134	137	141	145	149	153	157	162	167	173	179	185	191	197	202
32	127	129	131	134	137	141	145	149	154	158	163	168	174	180	186	192	198	203
33	127	129	131	134	137	141	145	149	154	159	164	169	175	181	187	193	199	204
34	128	130	132	135	138	142	146	150	155	160	165	170	176	182	188	194	200	206
35	128	130	132	135	138	142	146	150	155	160	165	170	176	182	189	195	201	207
36	129	131	133	136	139	143	147	151	156	161	166	171	177	183	190	196	202	208
37	129	131	133	136	140	144	148	152	157	162	167	172	178	184	191	197	203	209
38	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	198	204	210
39	130	132	134	137	140	144	148	152	157	162	167	173	179	185	192	199	205	211
40	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	206	212
41	131	133	135	138	141	145	149	153	158	163	168	174	180	186	193	200	207	213
42	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
43	132	134	136	139	142	146	150	154	159	164	169	175	181	187	194	201	208	214
44	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
45	133	135	137	140	143	147	151	155	160	165	170	176	182	188	195	202	209	215
46	134	136	138	141	144	148	152	156	161	166	171	177	183	189	196	203	210	216
47	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
48	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
49	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
50	134	136	138	141	144	148	152	156	161	166	171	177	183	190	197	204	211	217
51	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
52	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
53	135	137	139	142	145	149	153	157	162	167	172	178	184	191	198	205	212	218
54	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219
55 and up	135	137	139	142	145	149	153	158	163	168	173	178	184	191	198	205	212	219

Fig. 5.—Reprinted from Medico-Actuarial Mortality Investigation, Vol. I, New York, 1912.

BUILD—WOMEN

GRADED AVERAGE WEIGHT

Age	4 Ft. 8 In.	4 Ft. 9 In.	4 Ft. 10 In.	4 Ft. 11 In.	5 Ft.	5 Ft. 1 In.	5 Ft. 2 In.	5 Ft. 3 In.	5 Ft. 4 In.	5 Ft. 5 In.	5 Ft. 6 In.	5 Ft. 7 In.	5 Ft. 8 In.	5 Ft. 9 In.	5 Ft. 10 In.	5 Ft. 11 In.	6 Ft.
15	101	103	105	106	107	109	112	115	118	122	126	130	134	138	142	147	152
16	102	104	106	108	109	111	114	117	120	124	128	132	136	139	143	148	153
17	103	105	107	109	111	113	116	119	122	125	129	133	137	140	144	149	154
18	104	106	108	110	112	114	117	120	123	126	130	134	138	141	145	150	155
19	105	107	109	111	113	115	118	121	124	127	131	135	139	142	146	151	155
20	106	108	110	112	114	116	119	122	125	128	132	136	140	143	147	151	156
21	107	109	111	113	115	117	120	123	126	129	133	137	141	144	148	152	156
22	107	109	111	113	115	117	120	123	126	129	133	137	141	145	149	153	157
23	108	110	112	114	116	118	121	124	127	130	134	138	142	146	150	153	157
24	109	111	113	115	117	119	121	124	127	130	134	138	142	146	150	154	158
25	109	111	113	115	117	119	121	124	128	131	135	139	143	147	151	154	158
26	110	112	114	116	118	120	122	125	128	131	135	139	143	147	151	155	159
27	110	112	114	116	118	120	122	125	129	132	136	140	144	148	152	155	159
28	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
29	111	113	115	117	119	121	123	126	130	133	137	141	145	149	153	156	160
30	112	114	116	118	120	122	124	127	131	134	138	142	146	150	154	157	161
31	113	115	117	119	121	123	125	128	132	135	139	143	147	151	154	157	161
32	113	115	117	119	121	123	125	128	132	136	140	144	148	152	155	158	162
33	114	116	118	120	122	124	126	129	133	137	141	145	149	153	156	159	162
34	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
35	115	117	119	121	123	125	127	130	134	138	142	146	150	154	157	160	163
36	116	118	120	122	124	126	128	131	135	139	143	147	151	155	158	161	164
37	116	118	120	122	124	126	129	132	136	140	144	148	152	156	159	162	165
38	117	119	121	123	125	127	130	133	137	141	145	149	153	157	160	163	166
39	118	120	122	124	126	128	131	134	138	142	146	150	154	158	161	164	167
40	119	121	123	125	127	129	132	135	138	142	146	150	154	158	161	164	167
41	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	165	168
42	120	122	124	126	128	130	133	136	139	143	147	151	155	159	162	166	169
43	121	123	125	127	129	131	134	137	140	144	148	152	156	160	163	167	170
44	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
45	122	124	126	128	130	132	135	138	141	145	149	153	157	161	164	168	171
46	123	125	127	129	131	133	136	139	142	146	150	154	158	162	165	169	172
47	123	125	127	129	131	133	136	139	142	146	151	155	159	163	166	170	173
48	124	126	128	130	132	134	137	140	143	147	152	156	160	164	167	171	174
49	124	126	128	130	132	134	137	140	143	147	152	156	161	165	168	172	175
50	125	127	129	131	133	135	138	141	144	148	152	156	161	165	169	173	176
51	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
52	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
53	125	127	129	131	133	135	138	141	144	148	152	157	162	166	170	174	177
54	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177
55	125	127	129	131	133	135	138	141	144	148	153	158	163	167	171	174	177

Fig. 6.—Reprinted from Medico-Actuarial Mortality Investigation Vol. I, New York, 1912.

BASAL TWENTY-FOUR-HOUR FOOD REQUIREMENTS FOR BOYS FROM THE FIRST WEEK AFTER BIRTH TO TWELVE YEARS OF AGE, PREDICTED FROM HEIGHT.[1]

Height, cm.[2]	Predicted heat, calories.	Height, cm.[2]	Predicted heat, calories.	Height, cm.[2]	Predicted heat, calories.
51	160	85	645	119	920
53	185	87	670	121	945
55	210	89	695	123	965
57	238	91	715	125	990
59	280	93	730	127	1015
61	310	95	745	129	1035
63	330	97	760	131	1060
65	384	99	770	133	1083
67	400	101	785	135	1105
69	435	103	795	137	1130
71	465	105	805	139	1152
73	495	107	815	141	1175
75	525	109	825	143	1200
77	555	111	840	145	1220
79	577	113	855	147	1242
81	600	115	875	149	1268
83	622	117	895		

[1] Taken with permission from tables of Dr. F. B. Talbot.

[2] To convert inches to centimeters multiply inches by 2.54.

BASAL TWENTY-FOUR-HOUR FOOD REQUIREMENTS FOR GIRLS FROM THE FIRST WEEK AFTER BIRTH TO TWELVE YEARS OF AGE, PREDICTED FROM HEIGHT.[1]

Height, cm.[2]	Predicted heat, calories.	Height, cm.[2]	Predicted heat, calories.	Height, cm.[2]	Predicted heat, calories.
49	136	79	583	109	759
51	165	81	591	111	778
53	194	83	598	113	797
55	222	85	605	115	817
57	250	87	610	117	837
59	283	89	615	119	857
61	318	91	620	121	875
63	350	93	626	123	894
65	384	95	637	125	915
67	418	97	651	127	935
69	452	99	667	129	956
71	483	101	685	131	975
73	516	103	700	133	995
75	543	105	720	135	1016
77	567	107	740	137	1037

[1] Taken with permission from tables of Dr. F. B. Talbot.

[2] To convert inches to centimeters multiply inches by 2.54.

Supplies

On leaving the hospital the patient should have with him the following supplies:

One gram scale, with adjustable dial, see page 21.

One pint Benedict's solution (for qualitative sugar tests), see page 17.

6 test-tubes.

1 test-tube holder.

Insulin.

2 insulin syringes, see page 51.

6 hypodermic needles, 24 gauge, to fit syringes.

8 ounces 95 per cent alcohol, medicated with formaldehyd and glycerin, see page 52.

1 packet sterilized absorbent cotton.

The supplies listed above may be obtained either singly or together from the Weber & Judd Drug Company, Rochester, Minnesota, or from the Druggist University of Chicago Clinics.

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